

11,547 views | Nov 16, 2019, 08:40am

Sick Of Pesticides? Remember Death In The Time Of Cholera.



John Cumbers Contributor

[Manufacturing](#)

Synthetic biology networker, founder & investor, space bioengineer.



Chlorine and fluoride are pesticides you drink every day in your tap water. The alterna.. [+] U.S. NATIONAL LIBRARY OF MEDICINE

Pesticides tend to receive little else but bad press — bees are slain, lawsuits are filed, and proponents of everything from 'raw water' to 'clean food' cite the benefits of all that is 'natural'.

Yet pesticides are vital to human health, nutrition, and global food security. Simply put, we cannot live without them.

When we hear the word pesticide, we might think of [neonicotinoid-based insecticides](#) linked with the demise of bees in Europe. Or we might remember the days of DDT and the unintended effects of the widespread use of this harmful and toxic environmental

pollutant. We may look to the vilification of companies such as Monsanto, as they seek to defend glyphosate from a [litany of questionable accusations](#) regarding human health.

Not so obvious, perhaps, are the pesticides that we take for granted. The chlorine and fluoride in tap water that render it safe to drink (and even protect our dental health) by removing the bacteria and parasites that cause awful and often fatal diarrhea and dysentery, such as cholera and giardia. What about the antimicrobial food preservatives — with names like potassium sorbate and sodium benzoate — that allow us to safely eat food long after it has been prepared and stored for months or even years, greatly reducing food waste?

At some point or another, all of these have been the target of consumer outrage. There are many who legitimately fear the effects of agricultural pesticides on human health, those who are wary of food preservatives, and those who condone drinking untreated water. And there are still others who claim that fluoride is some kind of government mind control [conspiracy](#).

Today In: [Business](#)



The fact is, however, that pesticides — from chlorine in tap water to agrochemicals sprayed on or inserted genetically into crops — mostly act to keep us alive, healthy, and well-fed.

It is paramount that we are objective when discussing the costs and benefits of pesticides. To imagine a world without them does not bear thinking about.

Remember cholera

It's easy to forget that, not very long ago and even in developed countries with abundant clean water, cholera was a real and present threat to human lives. Go to the Democratic Republic of the Congo, or Yemen, and you'll see that when sanitation breaks down it's still a very pressing concern today. Millions of people are infected with cholera from dirty water each year and tens of thousands die because of it.

As far as trends go, therefore, the new found craving for the supposed benefits of 'raw water' is one to be particularly wary of. Rather than drink tap water, or filtered bottled water, proponents suggest drinking water straight from the source. [An utterly terrible idea.](#)

Yes, chlorinated tap water contains completely harmless, trace amounts of, say, shampoo or even some over-the-counter medicines. But more importantly, there is a distinct lack of cholera among those who drink it.

What about fluoride, which occurs completely naturally in water in low concentrations? There's a reason it is added to many brands of toothpaste. Among the 5.8 million people in the UK whose tap water has been bolstered with a little extra fluoride, a 2014 report [detailed a 21% reduction in dental cavities](#) in permanent teeth and [11% fewer 12 years olds with tooth decay](#).

Pesticides and preservatives in food are another common cause of fear and avoidance, yet [legislation ensures](#) that food companies must adhere to strict limits on the traces of pesticides present in edible products. Those levels are demonstrably safe for human consumption. The risk from pesticides and preservatives is incredibly low. Far safer than the alternative, which is food spoilage, or loss of harvests.

Consider, for a moment, the effect that urine from rats and mice might have on food safety, or the toxic spores of fungi and moulds. The diseases wrought by the bacteria *Clostridium botulinum* — as rare as it is — cause deadly food poisoning, [fatal in up to 5-10% of cases](#). The mycotoxins produced by fungi are [something best avoided](#).

Then there is the threat of food waste, in a world in which [820 million are hungry globally](#). In developing nations, where hunger is most prevalent, food losses during storage can be as high as 50-60%. [Chemical fumigation is very effective in preventing these losses](#).

Headlines this year cite [‘ultra-processed’ foods as being linked to earlier death](#). This link is neither causal, nor can it wholly explain the issue, which is perhaps largely to do a more robust link between eating ultra-processed food and generally poor socioeconomic circumstances. Even if it does turn out to be the cause, as [this well rounded article suggests](#), the risk of eating nothing but processed foods is most definitely *not* the preservatives that keep them safe to eat in the short term but more likely a lack of a balanced diet.

Pesticides are *potentially* toxic to people. That should go without saying: their raison d'être is to kill harmful microorganisms, insects, rats, weeds, and the like. But they are only harmful to people if they are used incorrectly, which is why a variety of legislative bodies exist to keep that from happening, and to keep our food and water safe.

Exploring the drawbacks

Pesticides are far from perfect. The drawbacks are clear and [potentially devastating to ecosystems](#), especially if they are misused indiscriminately on a large scale. On the other hand, food production is also heavily reliant on the protection that they give us from pests, weeds and disease. Where food production and wild ecosystems both rely on each other yet come into significant conflict - pollinators and pests - there's an excruciatingly

difficult balance to strike.

This year, [reports have been rife](#) of several synthetic pesticides being banned in the EU, including the most used fungicide in the UK and the USA, chlorothalonil. Neonicotinoids have also [been dropped entirely in France](#) due to their purported role in the [decline of wild bee populations across Europe](#) (alongside other probable contributing factors, such as the long-term decline of native habitats and wildflower meadows, climate change, and disease).

Farmers were [quick to point out that alternatives must be sought](#), for fear of emerging threats to crops by insect pests. It's a fair point. The Food and Agriculture Organisation (FAO) estimates that [20-40% of global crop production is lost each year](#) due to pests, with plant diseases costing the global economy \$220 billion. That's a serious dent to food security and the livelihoods of farmers.

It's important that we tackle the issues associated with pesticides, such as off-target toxicity and the plummeting populations of insects globally. However, it's equally important that we challenge the many falsehoods and misunderstandings surrounding their application and safety.

The hunt for objectivity

One such case is with the notorious herbicide glyphosate, which is widely used in a combined approach with GMO plants resistant to it. So effective is this weed killing solution, the global glyphosate market is [expected to reach \\$12.54 billion by 2024](#). Herbicides are so essential to ensuring food security that [even an organic advocate has recently promoted the use of them in sub-Saharan Africa](#).

The WHO lists glyphosate as a 'probable' carcinogen (along with coffee), which has led to thousands of criminal cases being brought against Monsanto, with lawsuits totaling billions of dollars. This listing is based on a [2015](#) review by the International Agency for Research on Cancer (IARC), which cites its own limitations.

One major limitation of that is that the IARC review was based on cherry picked studies which ignored conflicting evidence. A much larger and comprehensive 2017 study looked at 44932 applicators of glyphosate (with 4582 incident cancer cases) along with 20 different cancers and [could not find a causal link between glyphosate and cancer](#) (although there was a weak, however statistically insignificant, link with acute myeloid leukemia) - backing up decades of global consensus on the issue.

A can of worms was once again thrown up earlier this year, when [an article in the Guardian](#) written by the Research Director of anti-biotechnology organization US Right to

Know reported a 41% increase in risk for non-Hodgkin lymphoma due to glyphosate. [A stern examination](#) by epidemiologist [Geoffrey Kabat](#) suggests the paper from which this figure was drawn is flawed in many aspects, including the cherry picking of 'junk' datasets and an inability to adjust for confounding factors. An article in Forbes [concludes the same](#).

Environmental cons and pros

When it comes to toxicity to humans, glyphosate is incredibly [low on the list](#). In fact, glyphosate has [lower acute toxicity to humans](#) than 94% of all herbicides and even common kitchen chemicals such as vinegar and table salt. Unanimous to every regulatory body involved in the (incredibly skewed) debate is that [glyphosate unequivocally does not pose any harm to consumers](#) in the trace residues in which it is present in food.

Of course, there are issues associated with using herbicides, and in particular on relying overly on one type of pesticide. Glyphosate is so ubiquitous that there are many weeds that have become resistant to it, meaning that we must apply harsher chemicals to kill those left behind.

A recent study has also investigated the [effect of glyphosate on bees](#), showing an alteration in the bacterial microbiota that bees rely on in much the same way that our gut bacteria help us. It was shown that exposure to glyphosate increased the susceptibility of bees to a common pathogen, therefore affecting bee health. As [pointed out](#) by Dr Oliver Jones of RMIT University in Australia, however, the paper shows a potential effect, but not necessarily an environmentally relevant one.

An interesting environmental curveball, however, is that glyphosate is often the only tool in the armory for those [fighting the fight against invasive species](#), including the hellishly persistent Japanese Knotweed and phragmites grass, which pose a severe threat to native wildlife. Once again, this stresses that it is *how* we use the tools at our disposal which should be at the forefront of objective discussion.

Moving on

It would be an ideal world in which we could produce food in abundance without having to resort to using potentially harmful sprays. We're not there yet, but we are searching for ways to get us as close as possible.

Along with our knowledge, techniques for controlling pests are constantly improving, and where one product fails, a better one can likely step into the breach. For all that GMOs are maligned, between 1996 and 2016 they were responsible for increasing yields by 72% while [reducing pesticide usage by 583.5 million kilograms](#).

It is likely that, with our increasing ability to harness techniques such as gene editing, we will soon see synthetic biology solutions that can reduce this figure yet further. Insect pheromones, for example, are an emerging and increasingly successful prospect, if recent trials of [Pheronym's nematode bioremediation solution](#) are anything to go by.

What is for certain is that, whether we like it or not, we must resort to killing pests if we are to live long, healthy and well-nourished lives. As much as it would harm me greatly to drink a cup full of pure chlorine, I am very happy that it is present in low amounts in my tap water. As much as pesticides are a threat to certain ecosystems, they're also responsible for providing the planet with food in abundance.

As long as we are objective about the costs, as well as the benefits, we can keep moving as far towards that ideal world as we possibly can.

Acknowledgement: Thank you to [Peter Bickerton](#) for additional research and reporting in this post. I'm the founder of [SynBioBeta](#), and some of the companies that I write about are sponsors of the [SynBioBeta conference](#) ([click here](#) for a full list of sponsors).

Follow me on [Twitter](#) or [LinkedIn](#). Check out my [website](#) or some of my other work [here](#).



John Cumbers

I am the founder and CEO [SynBioBeta](#), the leading community of innovators, investors, engineers, and t who share a passion for using synthetic biology to build a better, more sustainable universe. I publish [SynBioBeta Diges](#); host the [SynBioBeta Podcasts](#); and wrote [What's Your Biostrategy?](#) the first book to anticip: how synthetic biology is going to disrupt virtually every industry in the world. I als [BetaSpace](#), a space settlement innovation network and community of visionaries, technologists, and investors accel industries needed to sustain human life here and off-planet. I've been involved with multiple start: operating partner and investor at the hard tech investment fund Data Collective, and I'm a former bic NASA. I earned my PhD in Molecular Biology, Cell Biology, and Biochemistry from Brown University originally from the U **Read Less**