



Editorial

The World Health Organization (WHO) describes One Health as recognising “*that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.*” Biotechnology has been used for decades to identify different issues. For example, biotechnology is used in GP clinic and veterinary practice tests to profile human and animal health.

One Health has been taught in veterinary schools for centuries. The WHO and other organisations have established global One Health activity. The health of the environment directly

influences human and animal health. In an ideal world, everybody and everything would be in the finest picture of health, but that is not the case.

I learned about Rachel Carson’s book called *Silent Spring* in the early noughties (c. 2000–2003). *Silent Spring* was published in 1962 and influenced the modern environmental movement. The Oscar-winning movie *Erin Brockovich*, based on the activism of a woman by the same name, was released in 2000.

Erin Brockovich helped build a case in 1993 concerning groundwater contamination that detrimentally affected the health of over 1000 people. The movie remains topical and related to

my article below. Eutrophication (you-tro-fik-ay-shun) is one place where One Health issues meet. If you watch the movie, look at the ponds. The ponds are green, so are they eutrophic, or is something else going on?

To repeat, it is important to highlight that the health of the environment has an impact on the health of humans and animals. Because the environment’s health directly affects human and animal health, medical writers intuitively know various documents that can raise awareness and help propel the environmental movement forward to improve global health.

Jen Bell

Eutrophication of fresh and marine waterways: Can medical writers, biotechnologists, and others help solve this problem?

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I was chatting with a few people recently when one of them mentioned how they went swimming in natural freshwater, and while they noticed a higher amount of blue-green algae in the water, they went swimming anyway. They said they felt “under the weather” as a result of their swim.¹ The conversations I had made me think of One Health and inspired me to write this article.

One Health concerns human, animal, and environmental health threat interfaces and I think algal blooms (indicating eutrophication) are a good example of where these health threat interfaces meet. Eutrophication can occur as a result of human activity, and it can occur naturally. So, more than identifying eutrophication alone is necessary to know if there is pollution from human activity in surrounding areas.

As medical writers, we can find many ways to do this type of research through our work.

Writing opportunities include:

- Environmental protection agency work
- Grant application work in agriculture, fisheries, food, or conservation

- Regulatory affairs work in agriculture, fisheries, food, or conservation

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There are undoubtedly more writing opportunities for medical writers to pivot and transfer their skills.^{2–4} One Health concerns human-animal-environment interface health threats, so it falls under the banner of medical writing.⁵ As the Organisation for Economic Cooperation and Development’s (OECD) Jim Philp wrote in his article for *Medical Writing* in 2023,⁵ “A clear role for medical writers will be to delineate change to regulatory systems necessitated by technologies ...” and this applies to most One Health issues. You need to roll your sleeves up and see what you can do to help.

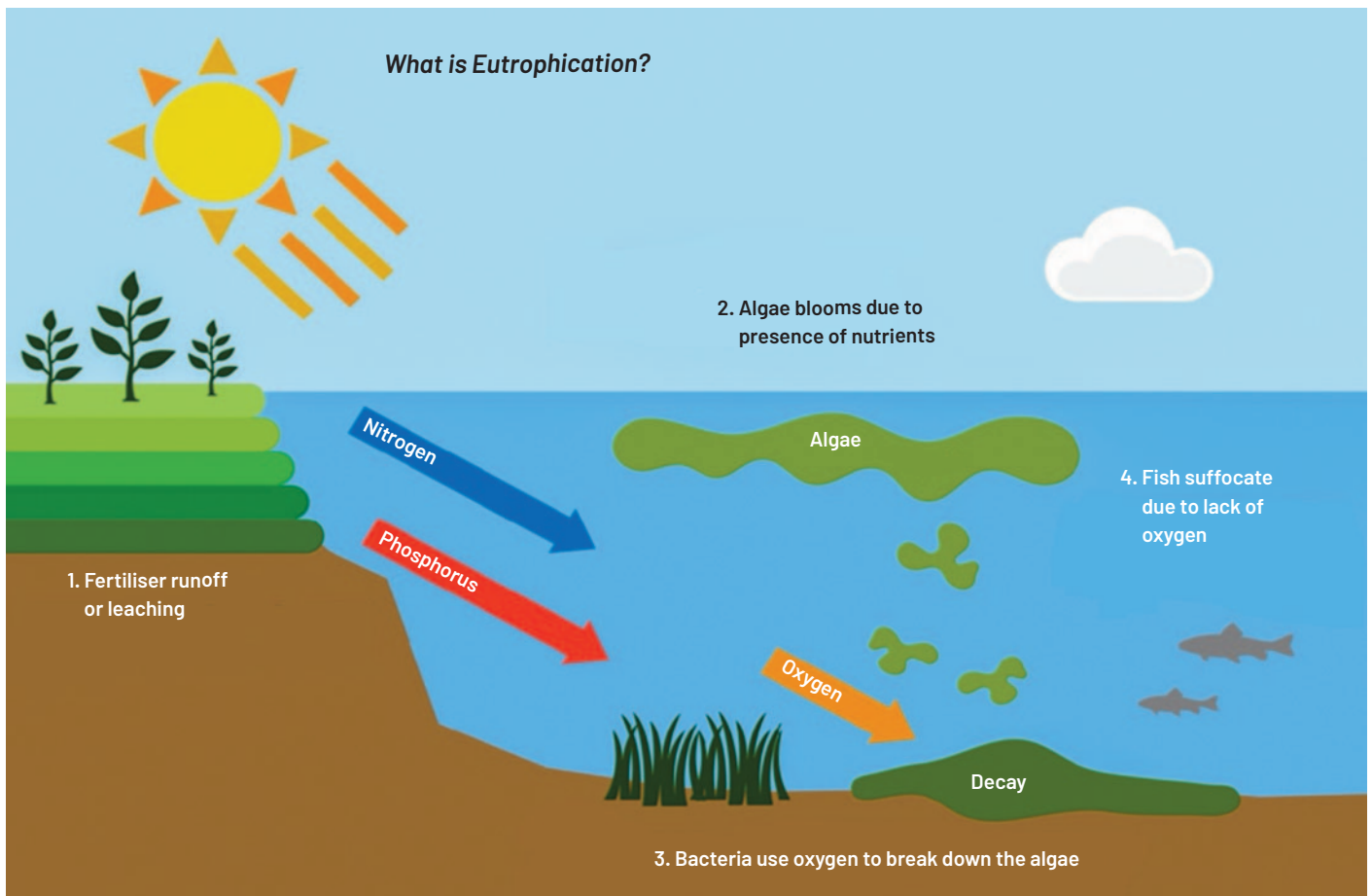


Figure 1. A schematic image that helps understand what causes eutrophication.⁹

Why might blue-green algae make someone feel ill?

Returning to the topic of blue-green algae, they are also known as cyanobacteria – algae or bacteria, which? Cyanobacteria were once called blue-green algae by microbiologists; however, “blue-green algae” is the term probably more commonly used by non-microbiologists. Blue-green algae are photosynthetic microscopic organisms that are technically bacteria (cyanobacteria).²

Environmental protection agencies use biotechnology (molecular, biochemical, and analytical techniques) to identify the presence of cyanotoxins in waterways.⁷ Cyanobacteria can produce cyanotoxins, which might cause liver, nervous system, gut, or skin reactions, and disturbances to any of these might make someone feel ill.⁶⁻⁸ Please note that boiling water will not stop toxic poisoning, so don’t boil “polluted” water thinking you can safely drink it.⁶

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High proportions of blue-green algal blooms can signify eutrophication (Figure 1). Algal blooms occur when there are high amounts of nutrients in waterways. Eutrophication reduces sunlight penetration, so it decreases the rate of photosynthesis by submerged aquatic plants. The death and decomposition of algae lowers dissolved oxygen levels, which in turn causes the death of other aquatic species. As decomposition occurs, nutrients are released, which increase algal blooms and reduce sunlight penetration, so the cycle continues.

The human I spoke to put feeling ill down to swimming in blue-green algae in a freshwater environment, which likely contains animals like fish. Fish are a food source for humans and various animals, like other fish, birds, and mammals (humans are mammals and there is a discussion there for another time). Eutrophication often results in reduced oxygen in water, which might cause fish and other species to die.

The chemicals that break down from dead fish and other species feed plants and microorganisms. Fish, birds, mammals, and plants inhabit the water, air, and land and end up as a food source for whatever eats them, so “poisons” biomagnify. Biomagnification is, “the process by which a compound (such as a pollutant or pesticide) increases its concentration in the tissues of organisms as it travels up the food chain.”¹⁰ Everything is connected, and if one part of something is ill, another part is likely sick too.

It is important to know that only a few algal blooms result in toxins – all algal blooms do not produce toxins.¹¹

Eutrophication causes are natural as well as from human activity, and biotechnology might help correct it

There are human causes and natural causes of eutrophication.¹² Human causes include agricultural runoff, industrial runoff, residential runoff, and recreational activities.¹² Natural causes include biogeochemical cycles, sedimentation dynamics, groundwater seepage, and

natural runoffs.¹²

Paul *et al.* (2022)¹² write in their review of literature that, “At a global scale, recent biomanipulation research has a skewed distribution in Europe (41.10%), East Asia (32.88%), North America (10.96%), South Africa (4.11%), South America (2.74%), Middle East (1.37%), Oceania (1.37%), and non-specific regions (5.48%).” They say they, “revealed the comprehensiveness of eco-bioengineering methods and their strong ecological resilience to recurrence of eutrophication and fluctuating environmental flows in the future.” They believe their review, “reinforces the supremacy of eco-bioengineering methods as cost-effective green technologies providing sustainable solutions to restore the eutrophic waters at a global scale.” Bio-manipulation and bioengineering are forms of biotechnology.

Farmers are knowledgeable business owners who make a living from the environment

I am writing about farmers because they are One Health custodians who have not always realised it.¹³⁻¹⁶ I also think governments have designated farmers as One Health custodians without necessarily realising it.

Some farmers learn their trade from the generations who passed it on, while others complete university degrees to set up their businesses. Farmers have a variety of backgrounds. To manage their businesses (and way of life), farmers know about the seasons, the land, animal and plant behaviour, regional agricultural laws and available funding, and various technological advances, for example, gene pool technology.¹⁷ Undoubtedly, farmers know more about what they do than me.

To explain my gene pool example, a large gene pool has lots of diversity, and a small gene pool has less diversity. The greater the diversity, the better a gene pool can withstand environmental change. Farmers are required to follow gene pool/germinal product legislation because of the various technologies they use.¹⁸ Gene pools relate to crops (plants), animals, and humans.¹⁹ Gene pools do not necessarily concern genetically modified organisms (GMOs). Monitoring a gene pool helps prevent various conditions and diseases that can be inbred. Farming is more concerned with the genetic diversity of an animal or plant. However, the same applies to an ecosystem – the greater the genetic diversity (the more species), the better an ecosystem can withstand environmental change.²⁰

In addition, some farmers might become involved in **pharming** (note the “ph” in “pharming”



Figure 2. If I knew the river might be polluted, I might not have conducted my morning ablutions in it. I brushed my teeth in it. I was in secondary school and had yet to learn about waterway pollution.

instead of an “f”). Pharming concerns growing (often genetically engineered) crops and animals for pharmaceutical industry therapeutic products that treat various illnesses.²¹⁻²³ And many medical writers provide writing services to the pharmaceutical industry.

Farmers and other food producers might hold keys that help solve eutrophication

Ways to divert algal blooms need to be realistic, and good people to speak to about this feasibility are farmers and other food producers. Farmers need to find a “sweet spot” of feasibility to earn enough to live and continue what they do. Without farmers, our supermarket shelves would be empty, and over the last few decades, the world has lost farmers because their way of life has become more difficult. A world without farmers would be horrible. Farmers made and continue to make a considerable contribution to building civilisations, and without them, I think civilisations will disappear. The Irish UNESCO World Heritage Site of Brú Na Bóinne (Brew Nah Boyn-ya.) identified that the first farmers settled in the Boyne Valley from about 4000 BC. Don’t bite the hand that feeds.

At the same time, farmers are under lots of pressure because, as the European Commission points out,²⁴ “World population growth, hunger, obesity and evolving consumer demands put pressure on agricultural production to improve food and

nutrition security globally. Simultaneously, farming and food systems must be resilient against the challenges of finite resources, environmental degradation, climate change and the loss of biodiversity.

Farmers are assigned so much with very little recognition or compensation for what they do. Ironically, farmers struggle to feed themselves and their families, never mind feeding the world.^{25,26} I don’t blame farmers for disrupting urban centres of power to ensure they are heard and get their needs met. Farmers worldwide are in a similar situation and are supporting each other.²⁷⁻²⁹ And while spraying manure and muck at government buildings shows distaste for the way governments treat farmers, spraying muck is a good symbol for various governments to realistically help farmers and others tackle causes of eutrophication and feed the world at the same time.

Eutrophication causes are not just from farming practices though. A significant factor of eutrophication is excessive nutrient loading. To repeat, human causes include agricultural runoff, aquaculture and concentrated feeding operations, industrial runoff, residential runoff, and recreational activities.^{12,30,31} Natural causes include biogeochemical cycles, sedimentation dynamics, groundwater seepage, and natural runoffs.^{12,27,28}

Final remarks

Regular people enjoy interacting with the environment without necessarily knowing what

dangers might lurk in it (Figure 2). Interacting with the environment is very normal and good for mental health, and in some cultures, it is part of their way of life. Governments protect all people and uphold human rights by protecting the environment. Farmers are good people to talk to about protecting the environment because they make a living from it, at least they try to. However, farmers are not the only people to talk to.

Farmers are invested in replenishing the environment so their land provides them a living year after year to be able to feed themselves, their families, and their communities – they are One Health custodians. Helping farmers improve their living standards will probably improve some environmental issues, including eutrophication. And reducing eutrophication will reduce the risks of people feeling ill after outdoor swimming – a popular practice that shouldn't end.³²

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Disclaimers

The opinions expressed in this article are the author's own and not necessarily shared by her employer or EMWA.

Disclosures and conflicts of interest

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New Special Interest Groups

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