iQ

Climate change is making us sicker

Climate change is expected to have a huge impact on the lives of everybody across the globe. One key area where there is growing evidence of adverse consequences is the spread of disease – and the UK and Europe aren't immune. By **Katrina Megget**

The summer holiday to the European seaside, a city escape or an adventure in the Alps, the continent is right on our doorstep. But there is an increasing risk you might bring back more than just a suntan or tourist tat. That's because pathogenic diseases are spreading and areas in Europe and the UK are now at risk of bugs that traditionally haven't been a problem.

The reason why is climate change – warming, heatwaves, droughts, wildfires, extreme rain and floods. These events enhance conditions that bring diseases and humans closer together and allow for new diseases to emerge, says Dr Tristan McKenzie, a researcher at the University of Gothenburg, Sweden, and co-author of a paper published in *Nature Climate Change* last year.

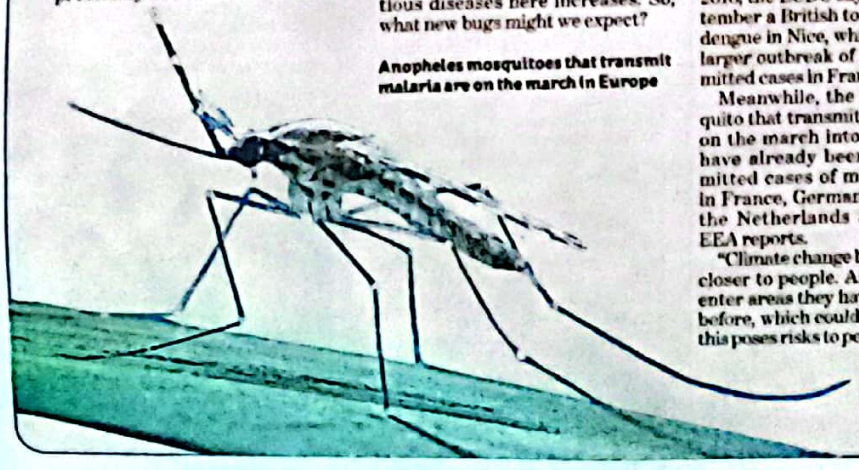
In that paper, McKenzie and colleagues found that climate change is already aggravating 58 per cent of infectious diseases (that's 218 out of 375 infectious diseases known to impact humans) and they point to "looming health crises" driven by climate change. "While it has been previously established that climate change can aggravate diseases, the magnitude of the problem and the number of case examples where this is already happening is quite surprising and very unsettling," McKenzie tells i.

Humans are already vulnerable to diseases but climate change will increase the risk of the emergence and outbreaks of infectious diseases – and this will happen in areas where the diseases haven't traditionally been present, says Dr Maria Van Kerkhove, emerging diseases and zoonoses and Covid-19 technical lead at the World Health Organisation (WHO).

For example, "we are seeing outbreaks of Marburg [a virus from the same family of viruses that cause Ebola] in locations that have never experienced Marburg outbreaks. We are seeing explosive outbreaks of chikungunya [spread by mosquitoes] in countries that had not previously experienced such outbreaks.

"We are seeing local transmission of dengue [also spread by mosquitoes] in areas that have never experienced this before," she says.

And as the UK and Europe warms, the risk of new and emerging infectious diseases here increases. So, what new bugs might we expect?



Anopheles mosquitoes that transmit malaria are on the march in Europe

DENGUE AND MALARIA

No one likes a pesky mozzie but the ones that transmit dengue and malaria, which traditionally live in the tropics, are starting to make Europe home, increasing the number of people at risk of these diseases. It's all thanks to warming temperatures (including mild winters and early springs) and precipitation changes.

According to the European Environment Agency (EEA), central and eastern Europe have the highest current climatic suitability for the specific mosquito species to establish themselves and transmit dengue, malaria and another mosquito-borne disease, West Nile virus.

Already, the mosquito species *Aedes albopictus* (known as the Asian tiger mosquito) is present in 13 European countries, while the Aedes aegypti species has been established in Cyprus since 2022 and may spread to other European countries, the European Centre for Disease Control (ECDC) has warned. The EEA says western Europe will emerge as a "hot spot" for the disease by the end of the century.

With the mozzies comes disease. The number of locally transmitted infections has been increasing since 2010, the ECDC says. Just last September a British tourist contracted dengue in Nice, which was part of a larger outbreak of 65 locally transmitted cases in France last year.

Meanwhile, the *Anopheles* mosquito that transmits malaria is also on the march into Europe. There have already been locally transmitted cases of malaria reported in France, Germany, Greece, Italy, the Netherlands and Spain, the EEA reports.

"Climate change brings pathogens closer to people. As these diseases enter areas they have not been seen before, which could include the UK, this poses risks to people with no pre-

Art

David Hockney

Luckily Harry Styles is not the star of this show at the National Portrait Gallery

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Theatre

King Lear

Kenneth Branagh's latest production is undermined by his own direction

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On the frontline of fighting disease, from left: Tristan McKenzie, Felipe Colon, Maria Van Kerkhove and Paul Hunter

vious immunity to these diseases and challenges to public health professionals that might be unaware of the symptoms," says Felipe Colon, technology lead at health research charitable foundation Wellcome.

FLESH-EATING BACTERIA

Warming sea water as a result of climate change is also becoming a potential breeding ground for the flesh-eating bacteria *Vibrio vulnificus*. This bacterium likes warm brackish (slightly salty) waters and can cause vomiting and diarrhoea or, if it infects a cut, it eats the flesh, causing necrotising fasciitis, which can potentially lead to amputation.

Warmer sea temperatures on the east coast of the US has seen infections rise eight-fold between 1988 and 2018, and now the EEA is noting warming European waters is putting swimmers at risk, particularly along the Baltic Sea coastline.

"An increase in reported infections in northern Europe corresponds in both time and space to heatwaves," says the EEA. This was seen with a substantial increase of infections in Sweden and Finland after a heatwave in 2014.

CHOLERA

Extreme weather events such as storms and floods have been implicated in waterborne disease outbreaks, such as cholera, in regions with inadequate water, sanitation and hygiene infrastructure. Traditionally, cholera would be considered low-risk in western Europe and the UK because of good sewage and water treatment systems.

However, the EEA reports that severe floods are projected for large parts of Europe as part of the changing climate, leading to a higher likelihood of waterborne diseases.

Eastern Europe is of particular concern to Dr Paul Hunter, professor in medicine at the University of East Anglia, because cholera is close to Europe's eastern border, especially Afghanistan and Syria. Given the devastation caused by war in Ukraine, Hunter says cholera could spread very easily if it was introduced.

"It is very easy to introduce cholera into a country - remember Haiti and the big cholera outbreak there [following a huge earthquake in 2010] which was brought into the country by UN peacekeeping troops from Nepal. Should cholera get a hold in Ukraine, it could then spread into neighbouring countries," Hunter says.

NASTIES LURKING IN THE ICE

Warming temperatures also mean melting ice and thawing permafrost, which can expose pathogens that have been frozen for thousands of years. This is believed to be the cause of an anthrax outbreak in the far north of Russia in 2016 where 72 nomadic herders were hospitalised and a 12-year-old boy died from the bacterial infection.

The region had been experiencing abnormally high temperatures and genetic analysis suggested the disease emerged from an ancient infected reindeer corpse as the ground thawed.

Not all ancient ice-melt pathogens could infect humans but there is a risk that some hidden in thawing ice and glaciers could by making their way into groundwater and drinking water supplies.

"The successful emergence of pathogens frozen in time could be regarded as a "Pandora's Box", given the potentially large pool of pathogens accumulated over time and the extent to which these pathogens may be new to people," McKenzie and colleagues write in *Nature Climate Change*.

DISEASE X

It's the unknown pathogen that has the potential to cause an epidemic or pandemic, that has many scientists working hard. This Disease X is likely to emerge from a virus, bacterial pathogen or parasite that jumps from animals to humans, known as zoonosis - which is the likely explanation for the origin of Covid-19, a previous Disease X.

The fear is that climate change will result in more habitat destruction through drought, wildfires or floods - all of which we have seen in Europe in the past year - which will bring animals and people closer together, increasing this risk of pathogens making the jump to humans.

Scientists believe some 10,000 viruses that have the potential to infect humans could be circulating silently in animals, and a study published last year in *Nature* estimates there could be at least 15,000 events where viruses jump between animals and humans for the first time between now and 2070, although not all of these will trigger a mass outbreak.

The WHO monitors pathogen families that have the potential to emerge as pandemic threats from anywhere in the world, while Wellcome has committed over £22m to develop digital tools to model the relationship between climate change and infectious diseases.

But McKenzie warns that with the sheer number of diseases and possible transmission pathways aggravated by climate change, it makes societal adaptation difficult. "Climate change presents large-scale, unprecedented threats to modern human civilisation. Disease is one aspect of this threat," he says.

"The main message here is that continuing under the 'business as usual' scenario will have serious consequences. Aggressive mitigation of greenhouse gas emissions globally is the path forward here."

FAST FACTS
DISEASE DANGERS

The global temperature for January-September 2023 was **0.52°C higher than average**, and 0.05°C higher than the equivalent period in the warmest calendar year, 2016.

Estimates suggest **four sextillion** (4,000,000,000,000,000,000,000) microorganisms will be released from ice melt each year.

The WHO's list of the most important **emerging infectious diseases** includes Crimean–Congo haemorrhagic fever, Filovirus diseases (Ebola virus and Marburg virus), highly pathogenic emerging coronaviruses relevant to humans (Mers and Sars), Lassa fever, Nipah virus infection and Rift Valley fever.

There were an estimated **247 million malaria cases** and 619,000 deaths in 2022.

Nigeria currently accounts for 26.6 per cent and 31.3 per cent of **all malaria cases and deaths globally**.