



Increasing water contamination from farming is a concern, but debate still rages as to whether one of those concerns should be increased nitrate levels and risk of colorectal cancer

Nitrates, drinking water and bowel cancer: Worrying link or red herring?

Southern correspondent **Fiona Cassie** takes a closer look at the science behind concerns over the health impacts of nitrates in water

Nitrates and other leachate from dairying could make Canterbury's water undrinkable in 100 years, public health officer Alistair Humphrey says.

Dr Humphrey has long been uneasy about nitrates. He began speaking out over a decade ago about the risk of blue baby syndrome from private Canterbury wells contaminated by nitrates and, more recently, was concerned by a Danish study suggesting a link between nitrate in water and risk of colorectal cancer (*Irt. J Cancer* 2018;143:73-79). He is calling for New Zealand to replicate that study.

It takes a long time for surface water contamination or improvement to filter down to aquifers. Environment Canterbury has reported it doesn't expect to see "clear improvements in groundwater quality for at least another 15 to 20 years".

But Dr Humphrey says the reverse could be happening; the worse contamination may be yet to reach the aquifers.

Environment Canterbury chief scientist Tim Davie says the Danish bowel cancer findings "concern us greatly, and we join Alistair Humphrey in asking for more research into it". Dr Davie made his comments via video on the regional council's website.

The nationwide study from Denmark – which has intensive farming across two-thirds of its land mass – linked very low levels of nitrates in drinking water to an increased risk of colorectal cancer.

Intensive farming has taken off in New Zealand in recent decades, with nitrate run-off from cow urine and nitrogen fertiliser putting river and aquifer water quality at risk, particularly in newer dairy areas like Canterbury and Southland.

Public-drinking water in Canterbury is safe, according to the latest Environment Canterbury report released last month. But leaching means 22 private wells have nitrate levels above the WHO-based, national drinking water standards.

The Danish study rang alarm bells for University of Otago, Wellington professor of public health Michael Baker.

However, they adjusted their findings for participants' education level – a good proxy for lifestyle factors.

A University of Otago professor of surgery and a colorectal surgeon, Professor Frizelle says he has been working on bowel cancer for 25 years. A risk from nitrates in drinking water "just doesn't fit" with what is known from the research, he says.

Higher consumption of red meat in rural areas – where nitrate contamination of water is more likely – and other lifestyle factors are most likely behind the association, he believes.

The WHO's International Agency for Research on Cancer estimated in 2015 that every 100g of red meat eaten daily increases colorectal cancer risk by 1.7 per cent, and every 50g portion of processed meat by about 18 per cent.

Bowel cancer is increasing "dramatically" for the under-50s, Professor Frizelle says. "So there is something happening early on that is triggering this...and it's mostly likely something environmental that we haven't nailed yet."

Nitrates in drinking water are another red herring, he says.

While increasing nitrate contamination of water from farming is a concern, he says anyone wanting to prove that nitrates in drinking water are bad for humans should look elsewhere than bowel cancer.

Professor Baker says known lifestyle risk factors for bowel cancer – such as obesity, eating red meat, and eating processed meat preserved with nitrates – probably contribute at least 30 per cent of the risk of colorectal cancer.

But as nitrates convert to nitrites in the gut, and are classified by WHO as a "probable carcinogen", he thinks nitrates in water could "easily be contributing" a small percentage of bowel cancer risk.

Professor Baker argues that the Danish study is high quality. There may be some confounding factors influencing the results, but the "precautionary principle" should apply.

"When there's a strong argument about the harms, until we prove otherwise, we should be taking every precaution we can to reduce nitrates in our drinking water."

Nitrate health risks

◆ Nitrates are relatively non-toxic, but the human gut converts nitrates to nitrites, at rates from 5 per cent up to 20 per cent for high converters; nitrites have health risks.

◆ Vegetables are the average New Zealand's largest source of dietary nitrates, followed by preserved/processed meats and drinking water.

◆ Nitrates in vegetables are not seen as a health risk due to the protective effects of antioxidants like vitamin C and E, and other beneficial health effects.

◆ WHO's International Agency for Research on Cancer (IARC) in 2010 classified ingested nitrates and nitrites as "probably carcinogenic to humans" under certain conditions where nitrites convert into forms of N-nitroso compounds.

◆ A 2011 WHO paper on nitrates in drinking water said epidemiological studies had found "no convincing evidence" of an association between gastric cancer and consumption of drinking water with nitrate levels of up to 45mg/L, or firm evidence of risk at higher levels.

◆ The current New Zealand drinking-water standards use the WHO-recommended maximum acceptable value of 50mg/L nitrate, equivalent to 11.3mg/L nitrate-nitrogen.

◆ The MAV is set to prevent blue baby syndrome, or methaemoglobinemia, where babies (in utero or up to age six months) convert excess nitrates into nitrites affecting the blood's ability to carry oxygen.

◆ Land Air Water Aotearoa, a collaborative of regional councils, reports there are higher concentrations of nitrate-nitrogen in rivers on the lowland regions of the Canterbury Plains, Southland, Waikato, Hauraki Plains, Manawatu Plains and Taranaki.

◆ The Ministry of Environment reports that about a third of 342 groundwater sites tested nationwide had higher than natural nitrate-nitrogen levels, and most sites between 2005 and 2014 had worsening trends in levels of nitrate-nitrogen and *Escherichia coli*.

◆ In 2015, IARC classified processed meat as "carcinogenic" after agreeing that eating processed meat can cause colorectal cancer.

Dr Humphrey agrees, and says the Government has a duty of care to see whether the association is as strong here as in Denmark.

"We can choose whether or not we eat red meat – we don't have so much choice about the water that comes out of our tap." ■

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