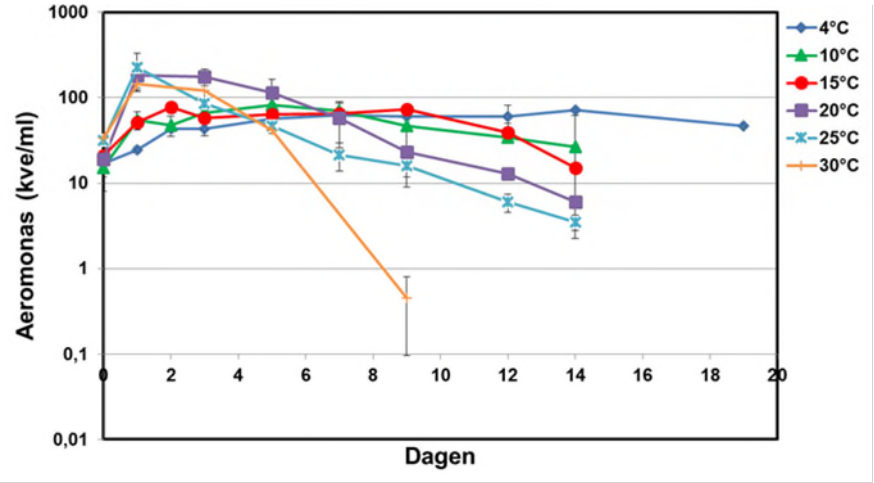
BTO *Executive Summary*

Aeromonas *grows faster at higher temperatures, but the maximum counts remain the same*

Author(s) Kimberly Learbuch MSc., dr. ir. Nikki van Bel

It is advisable to produce drinking water with the least possible amount of sediment and nutrients, so as to limit the growth of *Aeromonas* in the distribution network. Laboratory tests have shown that a higher water temperature leads to more rapid growth of *Aeromonas*, but that the maximum *Aeromonas* count is also possibly dependent on the amount and type of nutrients. This is the outcome of the Joint Research Programme study into the impact of higher drinking water temperatures on the growth of *Aeromonas*, which is the legal parameter for regrowth. The drinking water temperature is expected to rise as a result of climate change. Since the drinking water temperature cannot be influenced, and water practice shows that *Aeromonas* growth is temperature-dependent, the question then concerns the impact of increased temperature on the growth of *Aeromonas.*



Aeromonas *growth in bottles with drinking water and discharge water at different temperatures.*

Interest: impact of increasing water temperature on the growth of *Aeromonas*

The *Aeromonas* bacterium is an indicator for regrowth in the distribution network and must remain below 1000 kve/100 ml. However, during hot periods the legal standard for *Aeromonas* is exceeded in several distribution areas. Although *Aeromonas* is not a hazard for public health, these exceedances are not desirable.

The impact of the water temperature on the growth of *Aeromonas* is only known from water practice.

Data from the drinking water utilities reveal that the increase of *Aeromonas* in the drinking water distribution network begins in the spring/early summer, when the water temperature in the distribution area rises above 8-10°C.

It is expected that climate change will cause a rise in the temperature of surface water – which is used to produce drinking water – but also that the soil will become warmer, causing the drinking water to heat up further. This can raise the drinking water temperature above the legal standard of 25°C, without any counter measures being possible.

Higher temperatures can potentially lead to stronger growth of *Aeromonas* in the distribution network. However, the impact of higher temperatures on the growth of *Aeromonas* is unknown; this is the subject investigated in this report.

Approach: *Aeromonas* growth tests at different temperatures

In May 2018, drinking water and discharge water was sampled in the distribution areas of Driebruggen, Lekkerkerk, Braakman and Berenplaat. A mixture of *Aeromonas* strains was added to this water. The growth of *Aeromonas* and of the entire microbial population in the water was then measured, at temperatures between 4ºC and 30ºC, over a period of 14 days.

Results: *Aeromonas* grows faster from 20ºC, maximum count remains the same

Aeromonas grows in the water from Driebruggen and IJzendijke, and the growth speed is greater at higher temperatures (20-30°C), compared to lower temperatures. However, the die-off is also faster. At lower temperatures (4-15°C) the *Aeromonas* growth is slower, but the same maximum count is reached, and *Aeromonas* can persist in the water for the 14 days. In the Lekkerkerk and Berenplaat water, no growth of *Aeromonas* occurs, regardless of the temperature. But *Aeromonas* was able to persist in both water types at almost all temperatures.

Implementation: produce drinking water with as few nutrients and sediment as possible

Higher temperatures in the distribution system can possibly lead to a higher *Aeromonas* growth speed. Whether the *Aeromonas counts* in the distribution network actually increase depends, apart from the temperature, among others, on the amount and type of nutrients (including sediment) that is added via the drinking water. If sufficient nutrients are added to maintain the larger *Aeromonas* population, this could possibly result in longer periods with higher *Aeromonas* counts. This needs to be studied more closely however.

Aeromonas will grow less well in water containing fewer nutrients, including sediment. It is therefore advisable to produce drinking water with the least possible amount of sediment and nutrients, so as to limit the growth of *Aeromonas.*

In these experiments, the growth of *Aeromonas* was only studied under static conditions, and nutrients were only added in the beginning. It would therefore be important also to investigate the impact of water temperature on the growth of *Aeromonas* under dynamic drinking water conditions, in which new nutrients are added continuously.

Report

This research is described in the report *Temperatuurafhankelijke groei van Aeromonas in drinkwater* (BTO-2018.097).

Another relevant publication is:

- *Groei van Aeromonas op sediment en ongewervelde dieren uit het distributienet van de productielocaties Kralingen, Braakman en Berenplaat van Evides* (BTO 2018.037).

More information dr.
Nikki van Bel T
030-6069516
E Nikk i.van.Bel@k wrwater.nl

KWR
PO Box 1072
3430 BB Nieuwegein
The Netherlands