



## How clean is your clean water tank?

# TEST: CLEAN WATER

How do you keep water in the clean water tank of your motorhome clean and fresh? The NKC\* had six preservative agents tested in the laboratory of drinking water company Vitens, aimed at keeping water drinkable. Some far from deliver what they promise.

TEXT TJEERD VISSER // PHOTOS LAURENS AAIJ AND ALLART BLAAUBOER

The test of water preservative agents involves invisible pathogens that live in clean water tanks of motorhomes. So which pathogens are there exactly, how do they come into being and how do we get rid of them? Because clean water tanks are filled with local water that flows through separate hoses or through hoses from a water point, the problems start right there. Not to mention differences in drinking water quality between various countries, bacteria enter into clean water tanks through such hoses and by human touch.

**Bacterial slime** This is not a problem with regular use, although each residue in the water tank contains microorganisms that repeatedly contaminate newly added water. Continuously rinsing the tank with fresh water while en route reduces the risks considerably, but practically nobody empties the water reservoir completely before refilling it. In many motorhomes, a little water remains in the tank until the next trip. Heat combined with a standstill are the perfect ingredients for the formation of bacterial slime, notoriously known as biofilm. The best known pathogen in water is the legionella bacterium. Other pathogens are coliform bacteria and enterococcaceae.

Furthermore, there is biofilm, mentioned earlier, which is not a pathogen in itself,

but an ideal breeding ground for an explosive multiplication of pathogens. Biofilm consists of microorganisms bathing in self-produced slime that sticks to a surface. This slime layer can comprise up to 90 per cent of the size of the biofilm.

### *Sometimes the bacterium is the cause of the life-threatening Legionnaires' disease*

The remainder consists of bacteria that multiply rapidly. Moreover, the slime layer attracts new bacteria, that also multiply, produce slime, and so on. Biofilm is widespread in nature, from hot water springs to cold glaciers, like a smooth, green layer on a garden terrace, dental plaque, and, unfortunately, also in water hoses and clean water tanks of campers.

### **Contaminated droplets**

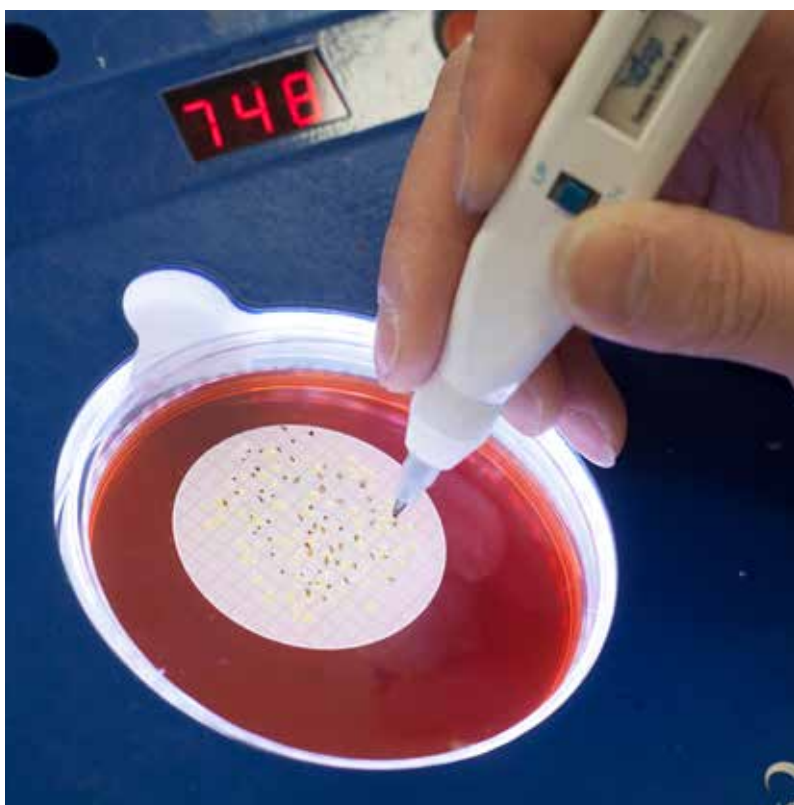
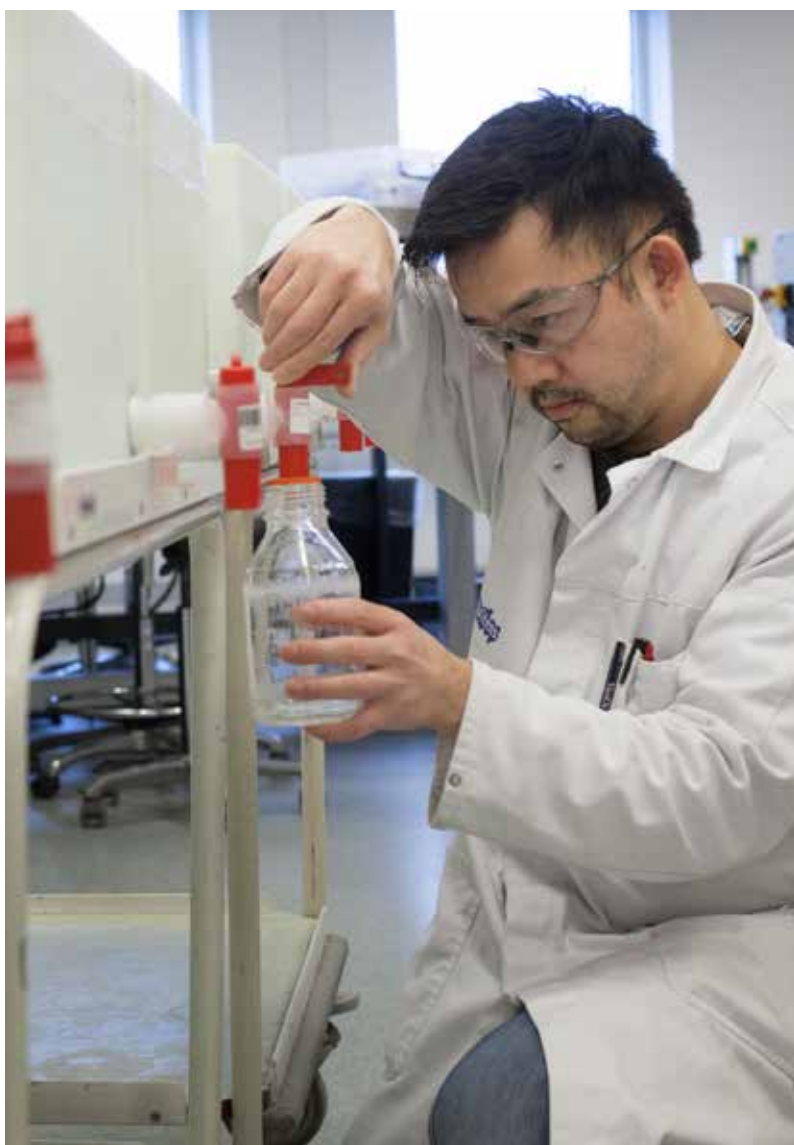
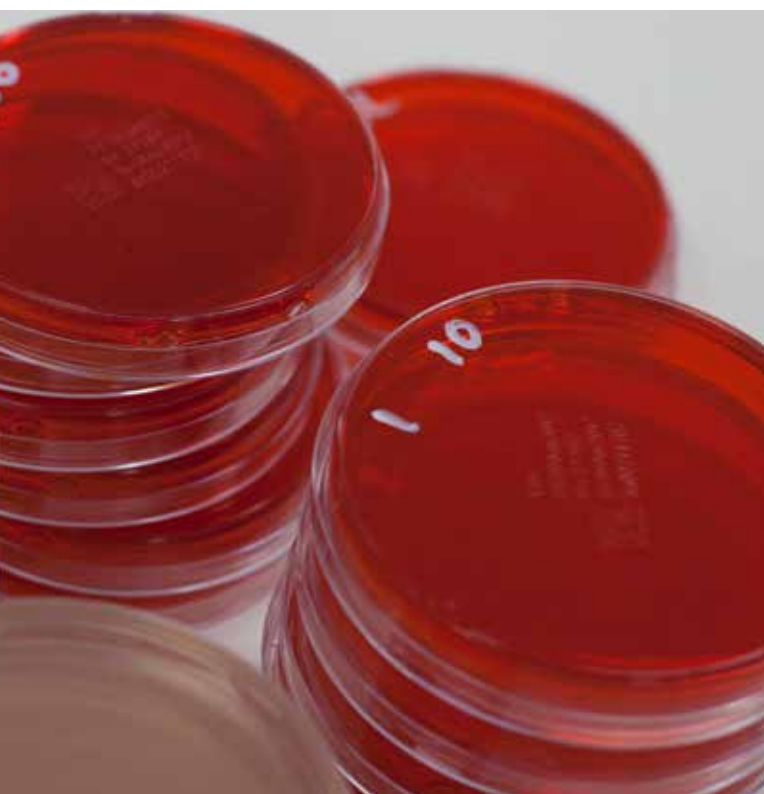
Legionella bacteria are present in very low numbers in soil and tap water. Multiplication can take place in water with temperatures ranging between 25 and 55 degrees Celsius. Large numbers can arise in stagnant water,

for example in spots of pipes that are difficult to access or when the motorhome is not being used. The bacterium dies in temperatures above 60 degrees Celsius, thus it is not the hot but cold water pipe that poses the risk. The temperature inside usually fluctuates between 15 and 35 degrees Celsius. Eventually, you get sick by inhaling the bacterium and not by drinking contaminated water.

### **Toilet use**

Inhalation of minuscule contaminated droplets can occur while taking a shower, spraying water or leaving taps running. After exposure to this bacterium, most people only have mild, flu-like symptoms, which disappear by itself. The bacterium sometimes causes serious pneumonia, however: Legionnaires' disease. The risk of pneumonia caused by legionella is low, but it does increase with age and the condition can be fatal. In summer, the disease is more common than in winter and men are more likely to catch it than women. Water in the clean water tank is contaminated with animal or human excrements when faecal coliform bacteria (Coli 37) are present. They cause fever, bowel inflammation, and hepatitis A amongst others. Chickens and other poultry always have enterococcaceae in their intestines. These bacteria are part of life, but they can make people sick. That is why it is important to always wash your hands







well after toilet visits and contact with food and certainly before filling the clean water tank.

### Natural bacteria

Normal, purified drinking water always contains a certain amount of bacteria that are not harmful to health. The colony number 22 °C, expressed in colony forming unit (CFU), indicates the exact concentration of these bacteria in water. It is an important indicator for measuring the effect of a purification process on microorganisms present in drinking water and for determining aftergrowth of bacteria in the water network. Thus, a colony number does not immediately give much information about consumer health. Extreme numbers of colony number bacteria can affect the taste and smell of water.

### Preservation methods

In order to prevent the formation of biofilm and to keep water in tanks clean and drinkable, motorhome travellers, mainly in warm countries, rely on chemical preservation methods. A well-known product is Hadex. Although it has a slight taste of chlorine, an earlier test at Vitens has shown that Hadex effectively and quickly eliminates all pathogens in a safe manner. By order of the NKC, Vitens also tested five other water preservation products from Dutch and German motorhome stores in exactly the same way. Some products are not available in the Netherlands because, apart from European Union standards, the Netherlands sometimes sets additional requirements for products, for example for those based on silver ions.



## THE TEST

The test tries to find the answer to the question whether these products ensure that clean drinking water does not go bad for at least three weeks and continues to comply with legal drinking water standards on all components. To this end, six clean containers are filled with contaminated water in the Frisian Vitens lab. Immediately afterwards, one sample was taken from each container and analyzed. According to instructions, the different preservatives were applied in five containers. The sixth container served as a blank reference sample. For each day of three weeks, the containers were tilted and shaken for good mixing at a constant temperature of 21 degrees Celsius. After 24 hours, 48 hours, one week and three weeks, water samples were taken in which the possible growth or decrease of bacteria was determined. In addition, testing took place in accordance with the Dutch Drinking Water Act of 2011. These norms are expressed in so-called CFAs: colony forming units, per milliliter or liter. T1 in test results stands for measurements after 24 hours, T2 after 48 hours, T3 after one week and T4 after three weeks.

### Legionella

Drinking water decision standard is <100 CFU/ liter. Hadex performs optimally. The AE Aqua Biofilter and the Plation tracker are unreliable. In the case of the other products, we see a slow decrease, comparable to the blank reference. After one week, only TankO3 has the bacterium completely under control.

#### LEGIONELLA (in kve/liter)

	T1	T2	T3	T4
Hadex	<100	< 100	< 100	< 100
Plation	300	8.700	< 100	34.400
Katadyn Micropur Forte	2.100	1.600	600	400
WM Aquatec Silvertex	600	600	300	100
AE Aqua Biofilter	11.000	7.300	4.600	90.000
Tank-O3	2.200	3.000	< 100	< 100
Blank	2.800	3.400	< 100	2000







Six vessels are tested in exactly the same way.

## Coliforms

Drinking water decision standard is <10 CFU/liter. Within one day, coliforms can no longer be detected anywhere during the test and neither in the blank. Possible effects occur due to connections of test containers. This outcome corresponds to earlier tests in which pathogenic bacteria introduced into water died spontaneously, sometimes even within one hour. (No table present because all values are within the standards).

## Enterococcaceae

Drinking water decision standard is <10 CFU/ liter. Hadex and Katadyn Micropur Forte work very well and very fast, with the other products it takes longer. The blank reference remains rather high, so all disinfectants work.

ENTEROCOCCEN (in kve/liter)	T1	T2	T3	T4
Hadex	< 10	< 10	< 10	< 10
Plation	100.000	420	< 10	< 10
Katadyn Micropur Forte	< 10	< 10	< 10	< 10
WM Aquatec Silvertex	70.000	100	< 10	< 10
AE Aqua Biofilter	20.000	40	< 10	< 10
Tank-O3	150.000	4.400	10	< 10
Blank	220.000	82.000	2.100	< 10

## Colony count

Drinking water decision standard is <100 CFU/ml. Only Hadex immediately gives the desired effect and retains that, the Plation tracker does nothing. Apparently, the AE Aqua Biofilter, Katadyn Micropur Forte and TankO3 still need to come on stream. Although they do not meet the standard, it is important that the colony number eventually drops, in contrast to the blank reference container.

\* Not measured exactly.

### COLONY COUNT (in kve/ml)

	T1	T2	T3	T4
Hadex	< 100	< 100	< 100	< 100
Plation	306	524	> 10.000	> 10.000
Katadyn Micropur Forte	596	352	> 10.000	800
WM Aquatec Silvertex	14	400	3.220	3.200
AE Aqua Biofilter	27	516	1.960	110
Tank-O3	313	> 1.000*	1.740	1.000
Blank	10	688	3.080	5.440

## Biofilm

All preservatives combat the formation of biofilm, although the effect of Plation is far from adequate. Hadex and TankO3 perform superbly.

### BIOFILM (in kve/cm<sup>2</sup> after 3 weeks)

Hadex	10
Plation	4.260
Katadyn Micropur Forte	135
WM Aquatec Silvertex	366
AE Aqua Biofilter	552
Tank-O3	6
Blank	24.000



## Prevention is better

Completely emptying the clean water tank for winter storage and periodically cleaning the tank is just as important as preserving the water in a filled tank. When emptying completely, all water taps and valves must be opened, and then the inside of the tank can be thoroughly cleaned with a suitable

product. Camping and motorhome stores offer various products. After cleaning, drain the tank again, fill with clean water and re-open all water taps and valves and rinse thoroughly. Do the same with the water hose. Specifically to limit the risk of legionellosis, water pipes that have

not been used for some time must be flushed, flushed thoroughly. The boiler temperature must be sixty degrees Celsius and the filler hose must be drained completely after use.



**1. Hadex, 250 ml chlorine**  
*Add to drinking water, approved for the Dutch market.*

**Dosage:** 10 ml per 50 liter water. In double dosage also suitable as to clean and disinfect a contaminated drinking water system.

**Duration of action:**  
2 weeks, each time when you refill the tank, add Hadex simultaneously.

**Shelf life:**  
cooled 3 years, not cooled 1,5 years.

**Active substance:**  
sodium hypochlorite (chlorine).

**Price:**  
€ 21,95 (250 ml).

**Information:**  
[www.hatenboer-water.com](http://www.hatenboer-water.com)



**2. Plation, Drijver**  
*Plastic floater with active carbon and Plation spheres for water conservation. Can be easily installed through the Inspection hatch of the watertank. Available in Belgium*

**Dosage:**  
for tanks up to a maximum of 75 liters. Also available for tanks up to 150, 250 and 400 liters.

**Duration of action:**  
12 months irrespective of the amount of water used.

**Shelf life:** 1 year.

**Active substance:**  
carbon and silver ions.

**Price:** € 37,50 (75-l-tank).

**Information:**  
[www.aquaesteurope.com](http://www.aquaesteurope.com)



**3, Katadyn, Micropur Forte**  
*Add to drinking water, not approved for the Dutch market yet. But already available in web shops.*

**Dosage:**  
1 gram per 100 liter water, measuring spoon included, application time is 30 minutes.

**Duration of action:**  
Drinking water up can be preserved for up to 6 months when using a particular amount of water per dosage

**Shelf life:**  
if kept cool and in a dark place: 6 years for water Preservation and 3 years for disinfection

**Active substance:**  
Sodium hypochlorite (chlorine) and silver ions.

**Price:** € 27,50 plus € 6,95 for shipping

**Information:**  
[www.noodzaken.nl](http://www.noodzaken.nl)



**4. WM Aquatec, Silvertex**  
*Put the mat in a clean water tank. The mat releases a certain amount of silver ions each time the tank is filled. Available in Germany.*

**Dosage:**  
Tanks up to 40 liters. Also available for tanks up to 120 liters

**Duration of action:**  
12 months or a maximum of 2.500 liters at a temperature up to 50° C.

**Shelf life:**  
12 months. Active substance: silver ions.

**Active substance:**  
silver ions.

**Price:** € 24.95 plus € 4.95 for shipping.

**Information:**  
[www.obelink.de](http://www.obelink.de)



*Samples are taken after 24 and 48 hours, one week and three weeks*



#### 5. AE Aqua, Biofilter C1-100

to be placed in a clean water tank. It consists of a filter with rings made of stainless steel mesh with coatings of precious metal. Do not use in combination with other products. Available in Germany.

**Dosage:** for tanks up to A max. of 100 liters, or for Tanks up to 50 liters.

**Duration of action:** 24 months at a maximum temperature of 60° C, irrespective of the amount of water used.

**Shelf life:** no expiration date

**Active substance:** free radicals that are formed during a catalytic process between precious metal coatings in the filter. After the free radicals have destroyed the micro-organisms they degrade into water.

**Price:** € 98,50

**Information:** [www.edelhoff-wire.de](http://www.edelhoff-wire.de)



#### 6. Tank-O3-System

Electrolytic cell that produces ozone, thanks to its gaseous form, it can also reach less accessible areas. like the upper part of an empty tank. Frequent cleaning of the tank is not necessary. The tank should be fitted with an air flow system. Approved for The Dutch market.

**Dosage:** volume of the tank is not relevant, tubes connected directly with the tank also become germfree. Really easy to use: press the switch and the system begins to work.

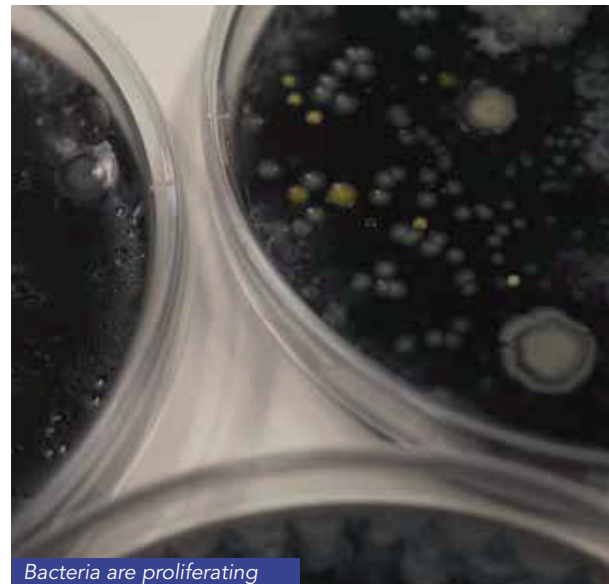
**Duration of action:** 1 whole season, irrespective of the amount of water.

**Shelf life:** no expiration date

**Active substance:** ozone, formed by electrolysis.

**Price:** € 399,- , cell replacement € 39,95.

**Information:** [www.tank-o3.nl](http://www.tank-o3.nl)



Bacteria are proliferating

## Conclusion

Although also in earlier laboratory tests it has been shown that pathogenic bacteria can disappear spontaneously, even in water without preservatives, these kinds of test situations at 21 degrees Celsius are probably not to be compared with circumstances in a water tank in a motorhome; a water tank which has been used and refilled for many years. Without preservatives, even in laboratory conditions, a considerable amount of non-pathogenic bacteria and biofilm is present in the water tank after three weeks.

This certainly applies to real life situations. Because the risk of pathogenic bacteria is increased, it is recommended to use a suitable preservative.

For those who want to play it safe in all circumstances, Hadex is the best option. It is very effective and cheap.

There are also disadvantages: there is a mild taste of chlorine and it requires discipline, because you have to keep on cleaning it at least every two weeks.

Of all other products, Tank-O3 performs best. A major advantage is that, due to gas formation, the upper part from the tank and tubes can be reached.

In order to make optimum use of this pricy but user-friendly system, it seems useful to switch on the system a day before departure. The use of bottled water as drinking water always remains a very good alternative of course.