

MYTH BUSTING

**The best way to use
pure water in the lab**

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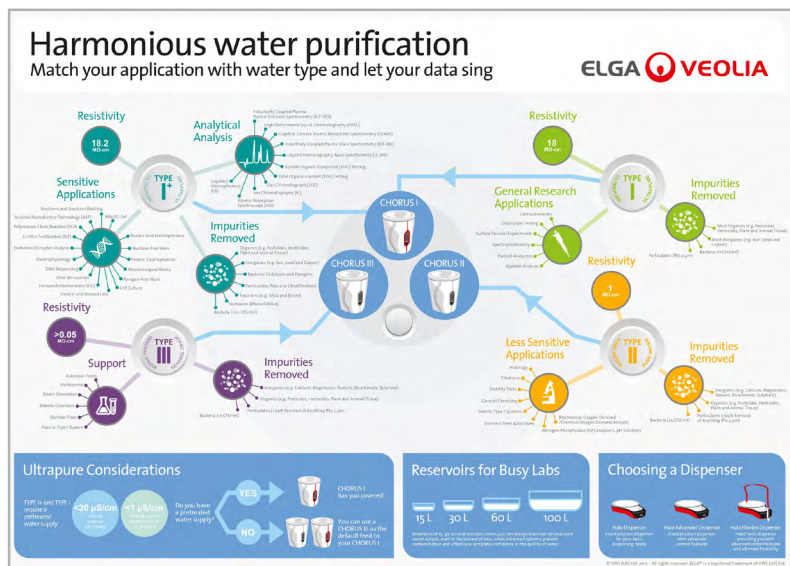
The role of pure water in the laboratory

Why do you need pure water?

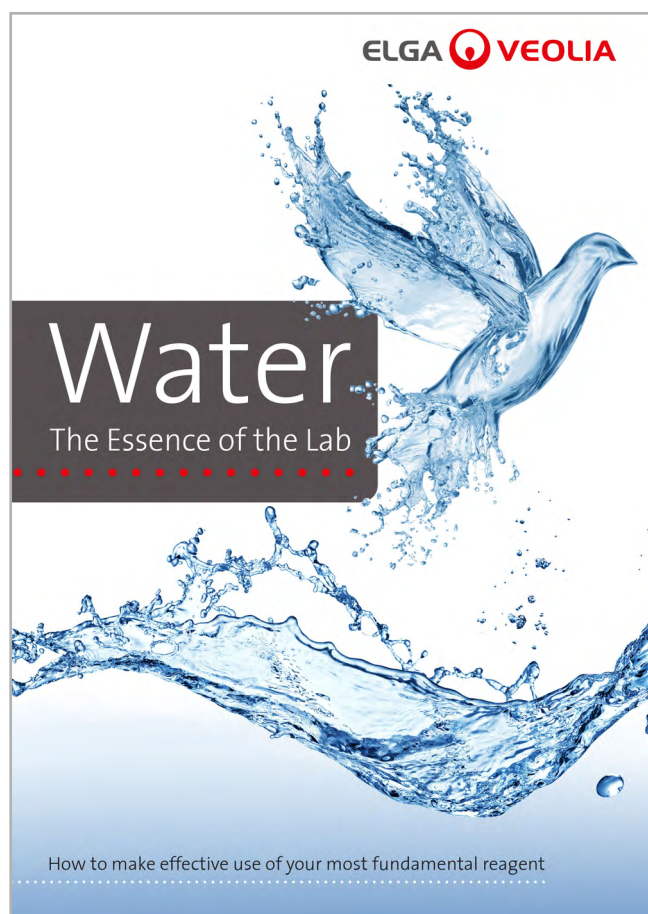
Water is an excellent and non-toxic solvent. That is why life on Earth is so dependent on it, and why it is the reagent of choice for much wet laboratory work across many scientific fields including biology, chemistry and physics. However, for the researcher, the strong solvent properties of water can pose a problem: it happily mixes with and dissolves a wide range of factors and is therefore easily contaminated. Laboratory researchers therefore use purified water for most procedures and experiments.

How pure does it need to be?

Different techniques demand different levels of water purity. When this is kept in mind, money and other resources can be saved i.e. by only using higher purity water for the applications that really demand it. For example, water for cleaning laboratory glassware doesn't tend to need to be that pure for most applications, whereas even low levels of contamination can quickly ruin a high performance liquid chromatography (HPLC) or mass spectrometry (MS) experiment. Simple grading systems exist to indicate the levels of purity in water, and these apply to both purchased batches of water and water from your own purification system (to learn more about how to select the ideal level of water purity for your application, download our infographic by [clicking here.](#)).



The role of pure water in the laboratory



Which factors can contaminate water?

A typical cup of unpurified water contains bacteria, organic particles, ions and gases amongst other things. Different purification technologies remove different contaminants, and you can use this information, as well as the grading systems, to decide how your water should be purified for your next experiment. All of these factors can impact on your experiments. For example, unwanted bacteria can introduce contaminant DNA into your sequencing project, while ions can interfere with your affinity purification experiment and organic particles might produce unwanted background readings in your MS readings.

To learn everything there is to know about how water is used in the lab, download our free guide by [clicking here](#).

The role of pure water in the laboratory



Buying bottled water vs using in-house purification systems

Many laboratories face a difficult decision: should we buy bottled water, or should we use a purification system to prepare our own? In both cases, you can obtain water of different grades, but there are many differences between these two routes. The decision you make should reflect the amount of water you use, the flexibility you need in terms of purity levels, the type of budget you have and the importance of saving money in the long term. With all of the different types of purity and the advantages and disadvantages of these two routes to pure water, it is sometimes difficult to get a clear idea of which option is best for you. To make things worse, there are number of misunderstandings (and even full-blown myths) around the pros and cons of using in-house purification systems. So that you can make the best decision for your lab, we've explored and debunked a number of those in this ebook.

In-house water purification systems are an expensive option

As we can all appreciate, it costs more to buy an in-house water purification system than a single bottle of purified water. But the true price comparison becomes more difficult to accurately assess once you start to consider monthly and lifetime costs, as well as any need for flexibility you may require in the near and long-term future.

Consideration 1: Unit vs running vs lifetime cost

Whether or not you opt for an in-house system might depend on your current funding. Do you have capital equipment funding?
Does your budget have sufficient funds?

After the initial purchase of a water purification system, subsequent costs will include those for consumables, source water, power and maintenance. In many universities and research institutes, only the first and last of these are normally paid out of the direct research budgets of each lab group. These post-purchase costs are generally lower than batch water costs, so you are likely to break even and start to save money reasonably quickly after buying an in-house water purification system.

If long-term economy is your goal, an in-house system is also your best chance of achieving it. Saving money is likely to be the goal of colleagues or those running your department and therefore you can discuss sharing the system with others who want an economical and flexible option.



In-house water purification systems are an expensive option

In-house systems are especially amenable to economies of scale. For example, with the PURELAB Chorus, you can have multiple dispensers for a single system, eliminating the need to install different systems in different areas and allowing a single unit to effectively serve the needs of a large group of users.

Other questions to ask yourself about your water needs center around your usage patterns. For example, does wet work fluctuate or remain constant? If you have a busy lab that uses a lot of water, an in-house system will probably meet your demands best, and the time taken to reach the point where you save money compared to buying bottled water will be shorter. Even if your lab is relatively quiet, you might not want to leave bottled water sitting around for a long time, as microbial spores might find their way in.



In-house water purification systems are an expensive option

Consideration 2: Cost-effective flexibility when it comes to changing the purity

If you use a lot of different techniques in your research, or if the future of your research could progress along several different paths, you will probably be changing the levels of water purity you use on a frequent basis. This might mean buying several bottles of water (each a different level of purity) and then leaving a lot of this water sat on the lab bench (where it's purity can come into question the longer it is left). Some water purification systems, allow you to easily reconfigure them depending on the levels of purity required.

Consideration 3: Reduced consumable use

You can save money in the lab by ensuring you get the most out of your consumables. Water purification systems are no different. At the same time, you cannot risk the quality of your data by using things that are out of date, or are no longer functioning at optimal levels. Fortunately, there are water purification systems available on the market that give you clear indications of cartridge exhaustion. This allows you to use each consumable to the end of its life without compromising water purity (or your data) and without being left without a pure water source should your cartridge unexpectedly fail.



In-house water purification systems are an expensive option

Consideration 4: Reduced user input time

Time is money. One of the reasons research becomes quicker over time is that simpler technical work can be replaced by technology, allowing technical staff to work on more complex (and often more interesting) procedures. In-house water purification systems are an example of such technology. For example, the [PURELAB Chorus system](#) has an auto-dispense function so that staff do not need to wait around for large volumes to be dispensed, as well as an auto-rinse function to reduce user-maintenance when system usage is low.



Once you've bought a system, you have less choice of purity level

There is always a fear when you settle on a solution that you will be 'stuck' within the limits of the system you choose (and so some water purification systems are relatively rigid in design, meaning this can be true in some cases). However, a number of water purification systems have been designed with flexibility in mind and can be easily and cost-effectively upgraded and reconfigured.

Consideration 1: Choose a system that can be easily re-configured

The water purification system you need depends not just on your purity demands but also on the level of contamination in your feed-water. Some suppliers will check this for you and can give you personal advice on how to match your system to your needs, before purchase. They can also help you to identify whether a modular system might be best for your needs. These are built from different units, including purification modules, dispensers and reservoirs, all of which can be removed, added or swapped depending on your changing needs.

Consideration 2: Explore systems built for variable usage

If your use of a particular level of water purity will vary over time, you might benefit from a storage system. The PURELAB Chorus system has an optional storage reservoir that uses recirculation technology to make sure the water doesn't get contaminated when stored over longer periods of time. This can save on costs to purify new water in the future and enables the system to meet demand during periods of peak usage.



There's rarely enough space to fit a water purification system

Some laboratories are cramped and full, and this can cause users to worry about getting their own water purification system as it will take up too much precious space. However, this isn't always true.

Consideration 1: Bottles can be big and cumbersome

Large bottles of water need to be transported to the laboratory, with the final step usually entailing someone in the lab carrying these heavy objects through the building. Once in the lab, they need somewhere to live; if you need different bottles for different types of water then your growing collection could soon take up more space than a purpose-built purification system.

Consideration 2: Some systems are configurable and scalable

Modular systems challenge the concept of space requirements and provide flexible options for location. For example, the [PURELAB Chorus system](#) can easily sit under the bench, while some system components can be wall-mounted, stacked or even physically separated and connected together to make the best possible use of nooks and crannies around the lab. In the same way, storage reservoirs can often be located in unfrequented lab spaces, as required.



It is difficult to ensure purity on an ongoing basis with in-house systems

With proper maintenance, a good water purification system will give you consistently pure water for years. Nevertheless, having a clear readout of water purity can give you peace of mind.

Consideration 1: Choose a reliable system and plan a maintenance program

It probably goes without saying, but we suggest that you always buy your water purification system from a reputable manufacturer and enquire to find out more about the maintenance programs they offer. At the very least, we'd always recommend planning out your own maintenance programs in advance, so that you can give your system a clean (and ideally a service) on a yearly basis, as well as a monthly check-up to ensure it is functioning as expected.

Consideration 2: Get a system that gives you instant access to real-time purity data

Real-time purity indicators make it easy to check on your purification system at any point, or on an ongoing basis, as required. Many of these systems monitor purity at the point-of-use via conductivity and total organic content (TOC) measurements to report on ion concentration and organic contamination. What's more, they can provide you with the means to download and print out the water purity data. (e.g. data can be transferred from the [PURELAB Chorus system](#) via USB).



It is difficult to ensure purity on an ongoing basis with in-house systems

There are several potential uses for this data. For example, you might be having problems with an experiment and want to make sure the water you used was pure (and therefore not the source of your issues). With the increasing demands of scientific journals for detailed data from studies, you may need to include this water purity data as part of a submission to a peer-reviewed journal or conference organizer. With bottled water you would have to test the water yourself, whereas with a system like the PURELAB Chorus, the data is all available at the touch of a button.

Consideration 3: Use technology that doesn't just purify your water but protects it too

Are you worried about your water becoming contaminated during storage? There are advantages to storing purified water, such as reducing waste and not having to wait for large volumes, but time can give contaminants such as microbial spores the chance to get into your water. Some in-house systems contain features that protect your water from such contaminants and monitor it to make sure no such contamination has occurred:

- Point-of-use (POU) filters are the last line of defense and remove contaminants that have found their way into stored water on its route from a cartridge or reservoir to the dispenser.



It is difficult to ensure purity on an ongoing basis with in-house systems

- Standing water is easier for microorganisms to contaminate than moving water. The PURELAB Chorus system employs recirculation at the POU to avert standing water. An auto-rinse feature is employed in the main system to avoid the same problem there, and the system is designed to have no static areas.
- Believe it or not, bacteria and fungi have preferences for different types of plastic. You might want to take this into consideration when choosing an in-house system and it definitely needs to be considered when using plastic containers for bottled water.
- Air entering a water storage system and water going out through an overflow outlet are potential entry points for contaminants. Some systems employ features to prevent this from occurring. The PURELAB Chorus utilizes vent filtration and a hygienic overflow system as well as a self-draining base.



In-house systems are often difficult to operate and maintain

Water purification systems may have been difficult to operate in the past, but most systems are now very simple to use and maintain.

Consideration 1: Some systems are specifically designed for ease of use

If you want a system that a wide range of users can operate with little to no training, select your system based on this need. For example, some suppliers have specialized engineers that can install the system and train users, while many modern systems are easy-to-use and most routine maintenance can be conducted by users independently.

Some systems allow users to select volumes for dispensing, making operating the system even easier, and the PURELAB Chorus maintains a memory of previous volumes so that commonly dispensed volumes can be quickly selected. Some systems also allow users to pre-select the flow rate. You can also benefit from good ergonomics when using some systems (for example, a foot pedal is available for the ELGA Halo dispenser). Meanwhile, if you need to use a storage reservoir, you could consider selecting one with an auto-fill function, in order to make sure you never have to wait for water to be purified when you need it.



In-house systems are often difficult to operate and maintain

To make things even easier, many in-house systems give advanced warning of consumable exhaustion (e.g. when cartridges are approaching expiration), so that new consumables can be ordered in advance to avoid any disruption in pure water supply. The PURELAB Chorus uses the PureSure system to make sure the purification pack is used to true exhaustion before replacement. The packs are easy to replace and the PureSure can increase the life of the consumable by up to 80%.

Consideration 2: Choose a system with intuitive feedback of system status

The easiest place and time for a user to check system status is at the dispenser, so systems that display purity status clearly on the dispenser offer an advantage. The ELGA Halo dispenser has a ring of light that changes colour if there is a problem, making this step even less intrusive. Following on this intuitive approach, the PURELAB Chorus buttons provide tactile feedback via vibrations. Systems with alarms can make sure any major problems get reported straight away and users don't use contaminated water.

Consideration 3: Good service networks exist

Some purification system suppliers have strong service networks and well-trained engineers. ELGA provide a reliable global service network ready to help you with any problems you encounter.



Buying bottled water is more environmentally friendly

If working in an environmentally-friendly way is important to your lab, you may be surprised to learn that in-house water purification systems offer a number of benefits over bottled supplies.

Consideration 1: Some systems have been specifically designed to help you save water and energy

Wherever water is purified, the process will normally consume electricity. ELGA have a sustainability commitment and our systems employ innovative solutions to reduce energy consumption, such as a high transmittance synthetic quartz sleeve in the Chorus 1. Any in-house water purification system is going to reduce the amount of energy used to transport water to laboratories. Water is also a resource that is in high demand, which is why ELGA offer high recovery kits to save water.

Consideration 2: You can select specific options to help you prolong consumable life

You can take steps to reduce consumable use by your in-house system. Don't change cartridges until they're exhausted, and look for the option to de-gas water, as the resultant water is better for downstream consumables, helping you to reduce consumable use in other applications too.



Buying bottled water is more environmentally friendly

Consideration 3: The hidden environmental impact of using bottled water

Bottled water is produced within a manufacturing facility and usually stored within plastic containers. In order to transport this water to labs around the world, you have to consider the carbon emissions of vehicles handling the transportation. The following table highlights CO₂ emissions (in grams) emitted per metric ton of freight and per km of transportation.

Modern lorry or truck	60 to 150 g
Modern train	30 – 100 g
Air plane (air cargo) B747	500 g
Modern ship (sea freight)	10 – 40 g

Source <http://timeforchange.org/co2-emissions-shipping-goods>

Secondly, one has to consider the environmental impact plastic waste can have. For example, did you know that labs are responsible for 3% of global plastic waste every year? This waste can be somewhat reduced by installing a water purification system.



In-house water purification systems aren't reliable enough

You need a reliable source of pure water to make sure your experiments don't lag behind. In-house systems are often more reliable than putting your faith in external suppliers to provide bottled water on time and to specification.

Consideration 1: Select systems built to deliver reliability

Some in-house systems offer specific features that enhance reliability and provide true peace-of-mind.

- Auto-rinse systems to prevent contamination
- Leak sensors
- Warning systems

If necessary, you can also run systems in parallel to make sure you have a source of pure water no matter what happens.



How to:

Select an in-house water purification system



We hope that you now have a better picture of the benefits offered by some in-house water purification systems. They can make sure you're using the correct water for your experiment, save you time and money and reduce your impact on the environment.

ELGA offer a number of systems for laboratory water purification, but the [PURELAB Chorus](#) is the most flexible yet. Using it you can:

- Cut down on labour and consumable, power and water costs
- Increase the reliability of your pure water
- Ensure your research team has easy access to the water they need
- Build a flexible, customizable system that is both space-saving and future-proof



Build a system especially configured for your needs

The PURELAB Chorus range of systems are modular, powerful and highly flexible, so you can design and specify the precise system to meet your unique needs. Our new Chorus Configurator guides you through the process, making it easier than ever to build your ideal system.

Access the configurator by [clicking here](#).



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