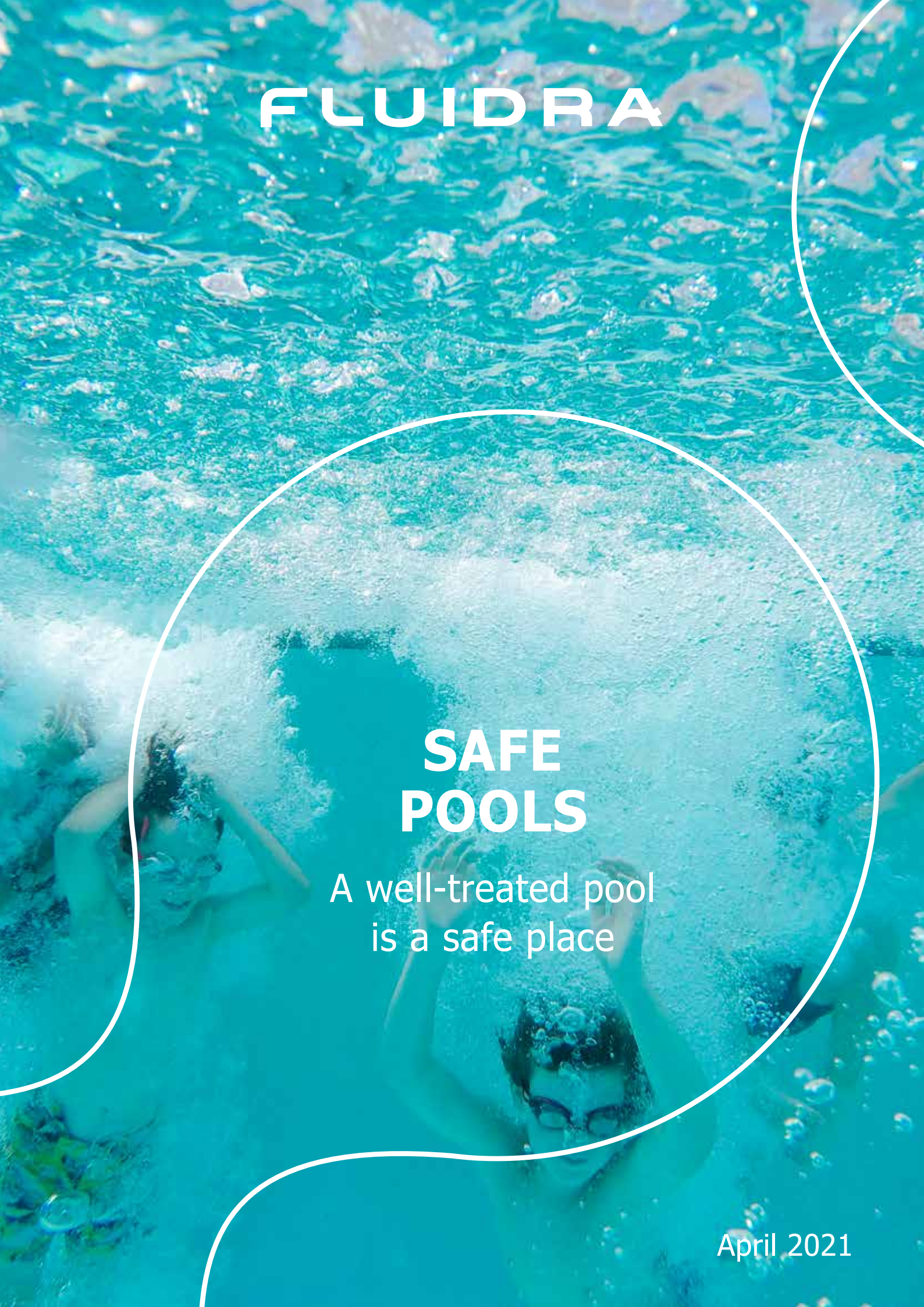
FLUIDRA



SAFE POOLS

A well-treated pool
is a safe place

April 2021

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SAFE POOLS A well-treated pool is a safe place

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01 INTRODUCTION

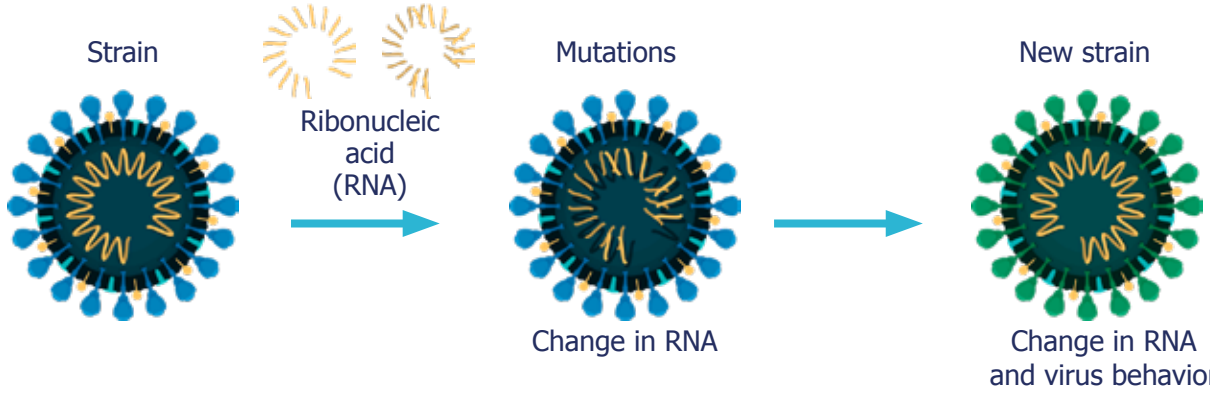
After the publication of this White Paper in April 2020, presenting scientific evidence on swimming pools being coronavirus-safe environments if treated properly, mutations in the SARS-CoV-2 virus have emerged.

These mutations have impacted the proteins embedded in the virus envelope, but despite this it still has the same structure, so disinfectants can eliminate the new variants of the virus, too.



02

HOW TO DEAL WITH VARIANTS OF THE CORONAVIRUS



The main change in the past year with regard to SARS-CoV-2 and its behavior has been the appearance of new variants, such as the well-known South African, British and Brazilian one.

Data available at the present time suggests the mutations in the virus have affected the envelope-embedded proteins, known as spikes.

These mutations can increase the virus's infection capability, but this does not mean they are more resistant to disinfectants than the initial virus. In this context, the US Environmental Protection Agency (EPA) issued a brief[1] in January stating that disinfectants are capable of killing all virus variants. The virus structure is therefore the same and because it is an enveloped virus it is still highly sensitive to disinfectants. This means we can confidently state that properly treated swimming pools remain a safe place even with the new variants of the virus.



03 A PROPERLY TREATED SWIMMING POOL IS A SAFE PLACE

Following the explanations above and based on the scientific evidence we can state that as long as they are treated properly swimming pools are safe for coronavirus and all its presently known variants.

There are two questions people may be asking in the run-up to pool season:

3.1. If swimming pools are being chlorinated in accordance with current recommendations and best practices, is this enough to inactivate the coronavirus?

Yes, for a conventional swimming pool with good hydraulics and filtration, operating within its designated bathing load, adequate water quality is achieved maintaining a free chlorine level of ≥0.5-1 mg/l throughout the pool.

In other words, with a free chlorine level of ≥0.5-1 mg/l the water is not only disinfected, it also has a disinfecting potential to eliminate any virus or germ that could enter the water[2].

It is important to remember that responsibility for swimming pools being properly treated lies with the pool maintainer but there are alternatives that can help relieve this load of responsibility. For example, there is the option of automating the pool for greater peace of mind.

The laws in force must also be followed at all times.



3.2. Should users take some extra precautions they weren't taking before?

As in our daily life we recommend maintaining adequate personal hygiene and social distancing. For example, if there may be a risk of having touched surfaces such as changing room benches, doors, or knobs, it is advisable to wash your hands and/or sanitize them with disinfectant before entering the pool.

We recommend bathers to always shower before and after swimming in the pool. We also recommend washing bathing suits and towels to eliminate all bacteria and viruses.

In addition to the pool water, the pool surround must be disinfected, as must extra features such as showers, ladders, etc., by using products specially recommended for doing so. It is also essential to respect all the pool manager's instructions, restricted access areas, passageways, traffic flows, etc.

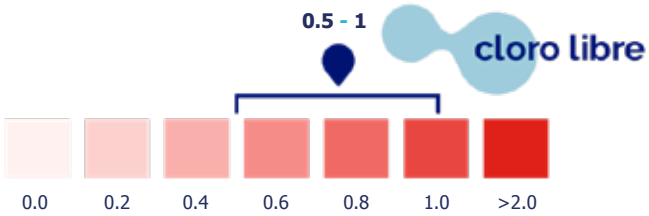


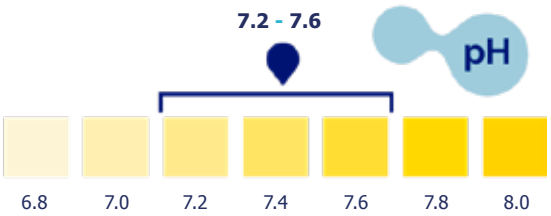
A WELL-TREATED SWIMMING POOL IS A SAFE PLACE

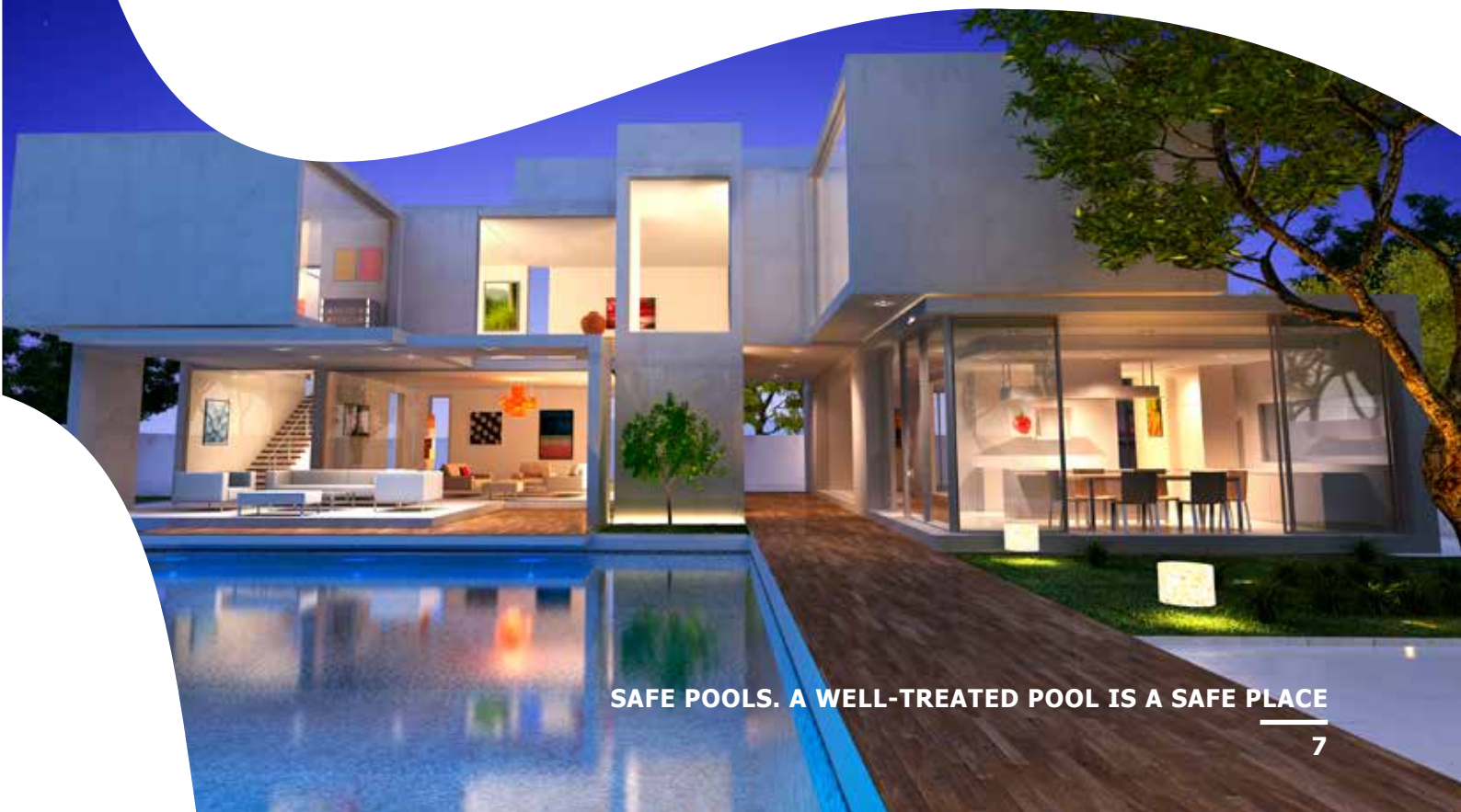
04 RECOMMENDATIONS FOR RESIDENTIAL POOLS

The correct level of free chlorine in the pool water can be reached by using chlorine tablets or liquid chlorine products. Automating the dosing and control process is recommended. An excellent alternative is to use salt water chlorination devices that automatically generate free chlorine from salt dissolved in the pool water.

To amplify the disinfection spectrum, as an extra level of protection and to shield against potential errors in the manual disinfection process, ultraviolet (UV) light can be used to disinfect pool water (in combination with either chlorine dosing or salt chlorination).







05 RECOMMENDATIONS FOR PUBLIC POOLS

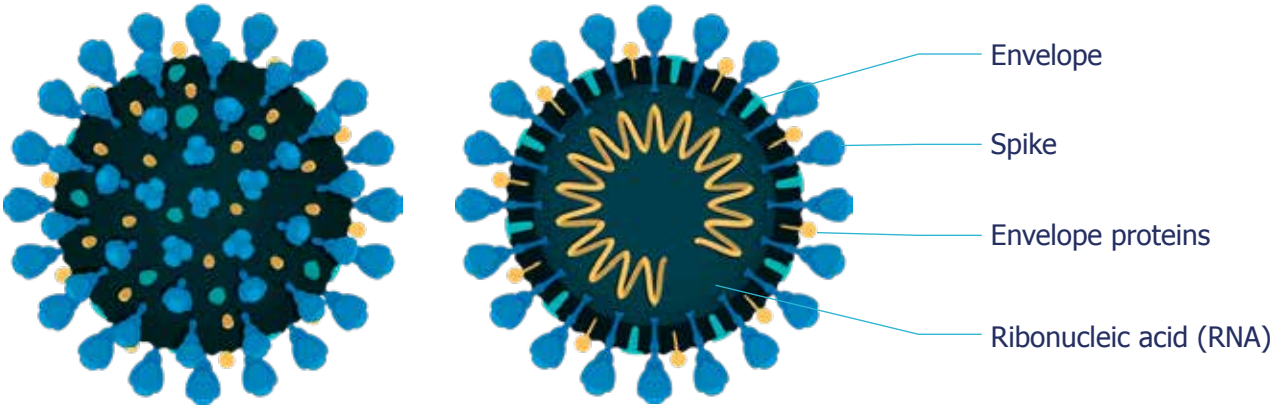
Automation is highly recommended in public pools, which usually have a higher footfall than residential ones, as well as the online measurement of core metrics using a smart pool analyzer.

To that end, we make the following recommendations:

1. A correct pH regulation between 7.2 and 7.6 with acids or by means of CO^2 will be essential for effective disinfection.
2. To amplify the disinfection spectrum, the use of UV light is highly recommended in combination with chlorine dosing (tablets or liquid) or salt chlorination.
3. Continuous measurement of pH and chlorine levels and the automatic regulation of these metrics is a must in public pools. Tip: It is a good idea to display measurement results to users to keep them fully informed of the water quality.
4. In the case of an indoor pool, UV air disinfection is advised.



06 A DEEP DIVE INTO THE SARS-COV-2 VIRUS



Covid-19 is the respiratory disease caused by the SARS-CoV-2 virus that we all know as Coronavirus. It is just one of the seven coronaviruses that can infect people, like SARS (Serious Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome)[3].

This family of viruses has similar physical and biochemical properties and comparable transmission routes.

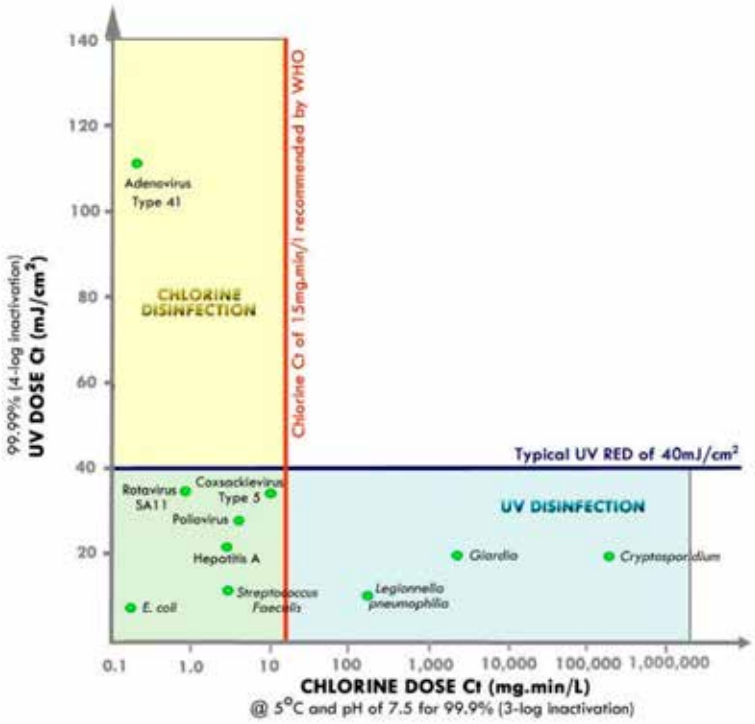
Virus genetic material is packaged inside protein structures called capsids. Viruses are divided into three groups depending on whether they are enclosed in an outer lipid membrane (enveloped) or not (non-enveloped)[4]. The difficulty in eliminating a virus depends on the group to which it belongs.

Ease of elimination	Difficult ↑ Easy	Non-enveloped, small
		Non-enveloped, large
		Enveloped

SARS-CoV-2, the virus responsible for COVID-19, is an enveloped virus and therefore one of the easiest to eliminate.

The World Health Organization (WHO) states that a residual concentration of free chlorine of ≥0.5 mg/l in the pool water after at least 30 minutes of contact time at a pH <8.0 is sufficient to kill enveloped viruses like coronaviruses[2].

Diagram: Efficacy levels of disinfection by chlorination and by UV light in the inactivation of various viruses[5].



The diagram shows different efficacy levels in the inactivation of various viruses and pathogens. Coxsackievirus, Poliovirus, and Rotavirus are examples of non-enveloped viruses. It can be seen that they are inactivated at a chlorine Ct of less than 15mg/min/liter. (A Ct value is the product of the concentration of a disinfectant (e.g., free chlorine) and the contact time with the water being disinfected).

An enveloped virus such as the COVID-19 virus would therefore be situated in the green area of the diagram and be inactivated at even lower Ct levels.

As shown in the diagram, UV light disinfection amplifies the efficacy spectrum against other viruses considerably. UV light has the ability to destroy the genome (DNA/RNA) of viruses, bacteria, and fungi, including coronaviruses. Standard disinfectants are effective against SARS- CoV-2, but as an extra level of protection, and/or to shield against potential errors in the manual disinfection process, ultraviolet (UV) light can be used to disinfect pool water after the chemical disinfection process is completed[6].



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- Swimming pool water inactivates Covid-19 virus in 30 seconds, new study finds: **https://www.swimming.org/swimengland/swimming-pool-water-inactivates-covid19-virus/**

"This information contains general recommendations that must be taken into consideration on a case-by-case basis. This information is not an instruction manual and cannot be considered as such for any purpose. Any implementation or installation to be made must be made by a professional and under the appropriate guidelines. In this regard, each user is responsible for the application it makes of the information contained herein. Fluidra will not be responsible for its use. Consequently, under no circumstances will Fluidra be liable or responsible for any claim, damages or loss that may arise as a consequence of the use of this information".



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