SOME HISTORY AND METHODS BEHIND AQUARIUM DECHLORINATION

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Bad Gas

Or How Long It Really Takes to Remove Chlorine and Chloramine

In the 1970s, I had 5 small marine tanks. Mixing salt and minerals in a bucket, I used to degas the water by simply waiting for 2-3 days. Others I knew set up a reservoir tank outside to allow the sun to assist and used it in 24 hours. A few years into it, a local pharmacist turned me on to sodium thiosulfate and sold me bottles of it to dechlorinate my fish tank water, making life substantially easier.

With so many good dechlorinators available now, it seems dated to discuss this but for those of us old enough to remember degassing as the default dechlorination technique, it attaches some interesting numbers to dechlorination and perhaps some potential for automatic water changing setups.

Most municipalities have their water parameters available online. You can check the chemical and mineral content in publicly available reports such as this one from LA County:

LA County Water Quality and Content

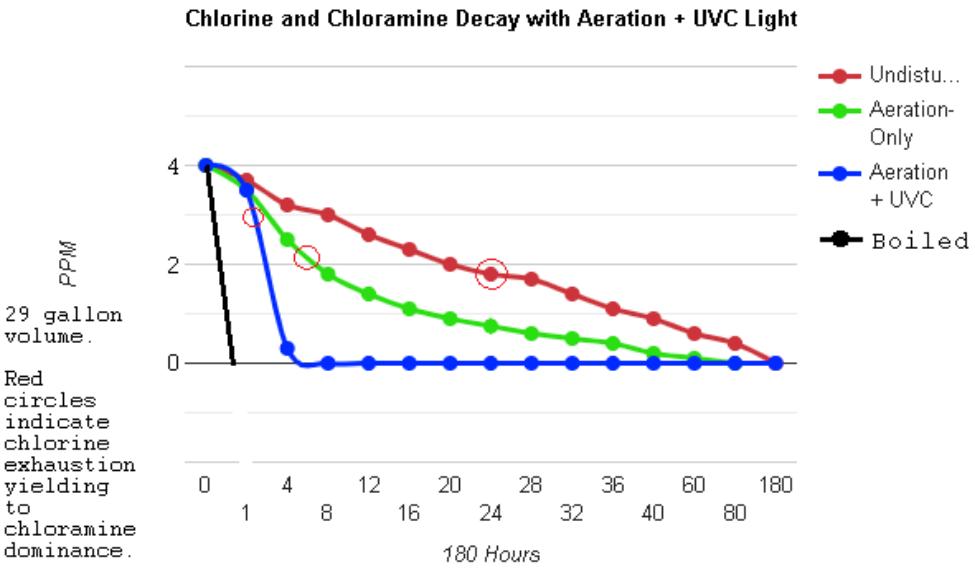
Most will use chlorine + chloramine. Here in greater Los Angeles, the chlorine + chloramine content is as high as 4PPM (the federal limit), which would be fatal to most fish.

Both chlorine and chloramine can be most quickly negated by **boiling** but that is rarely a practical approach! **Aeration** and **agitation** will accelerate this and while VERY effective on chlorine, it's still rather impractical for chloramine.

However, **UV light** can GREATLY accelerate the breakdown and dissipation of both chlorine and chloramine though, *sometimes to its own detriment.*

In LA, with its 300+ sunny days a year, many public swimming pools are covered in part to prevent the UV from degrading the disinfecting action of the chlorine/chloramine as the UV breaks it down within hours. Most use an additive, *cyanuric acid* to prevent UV light from breaking down chlorine in pools.

The addition of chloramine to chlorine treatment by municipal water supplies is well thought out. Though--partly gas, partly solid, but both are *timed* to continue their disinfection almost seamlessly over the life cycle of the two.



This is the decay of the chlorine + chloramine in a 29-gallon, rectangular, open top tank at 80° and pH=8.

If you look at the **red** line, it is the normal water with no agitation nor treatment. Notice the slow decay of disinfectant level. At Hour 24, the chlorine has actually dissipated (shown as a barely perceivable dip *encircled* on the red curve around Hour 24) but the chloramine maintains the level, almost perfectly linearly, as if it was just added at Hour 24. It slowly degasses, each hour about the same amount, until Hour 180 upon which it reads 0. *That's some quality engineering.*

It's also a very long time to get rid of chlorine!

Notice the **green** line. The same exact rig but with aeration. Just mild aeration and it drops from 180 hours to 70 hours. Better. But still too long...

Then the interesting one.

The **blue** line represents the same setup again, with aeration *plus* a commonly available UV light sterilizer for fish tanks. This UV sterilizer had a 13w bulb and an output of about 200GPH. The UV added so much photochemical energy, it was completely devoid of both chlorine and chloramine in under 6 hours!

But next is the kind of thing that gets me excited (although I'm easily amused)!

Notice the small, **red circle** on each of the curves. That encircles the "knee" of each curve. That 'knee' is where the chlorine has been exhausted *but* the chloramine is still very much active. With *aeration alone*, the chlorine is gone in 6 hours, but *the chloramine needs 70 hours to be removed.*

But look at the **red circle** on the **blue curve**. *The UV light completely removed the chlorine in only 2 hours and totally removed the chloramine in 6 hours!*

Even fa$ter?

UV dechlorination can be sped up with much stronger UV light. The UV sterilizer mentioned above is a “low pressure” lamp whereas high output dechlorination lamps are known as “medium pressure”.

Should you have an extra $700 lying around, this UV light can be a *conditional* alternative to ROI, *if* your water’s mineral composition is desirable, at a reasonable size and cost:

Mighty Pure UV Water Purifiers 3–20 GPM NSF - BuyUltraviolet

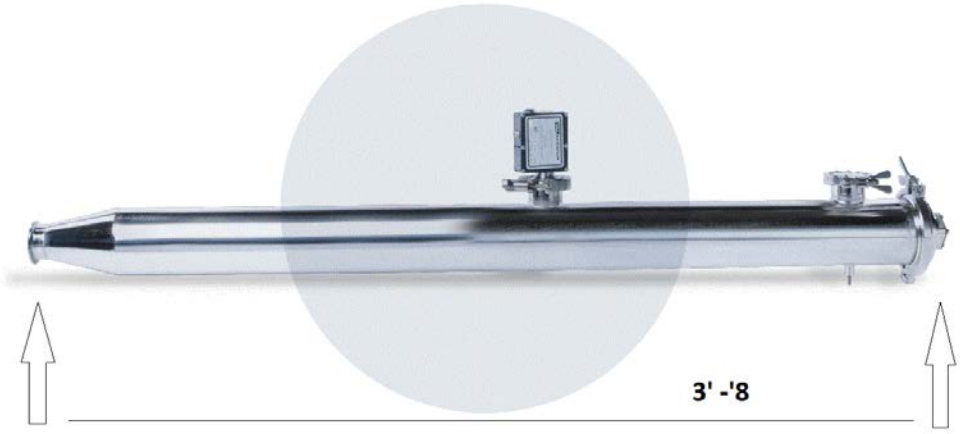
By passing your faucet through this device, it will remove 100% of the chlorine, chloramine and all microbes with UV light, without changing another single aspect of the water, all in a single pass (*but the GPH depends on cost)*. This one disinfects at a rate of 180GPH, but it would need to run at about 1/10th the *disinfection rate* to dechlorinate as well, making the output about 15-20GPH.

The more reasonably priced ones *may* be of value for *automatic water changers* if ROI isn't required or the lost minerals ROI removes are actually desired. No membranes nor filters will ever clog, no microbes will pass, and all the minerals will be retained, (*if the latter is actually a good thing*). Every 10,000 hours of use you'll need a new bulb and an occasional cleaning.

But spending about $2000 or much more enables some 200GPH or more of dechlorinated and disinfected water to exit and these come in as large a scale as one can imagine or afford.

These are industrial in size but are industry standards for chemical-free dechlorination and disinfection:

[UV Dechlorination, Chemical-Free]



These industrial UV dechlorinators are used in breweries and laboratories for extremely high purity water systems where *no* amount of chlorine or especially, *the inert byproducts of chemical dechlorinization* may remain in the water.

With this device, it is your water with no disinfectants or microbes at any flow rate you wish, all else unchanged.

Personally, I just use Prime®!

If there's a reason to degass without using a dechlorinator, admittedly I don't actually know what that would be but perhaps others may.

Nonetheless, I thought some might find the data interesting!