

# ***Friendly Aquaponics, Inc.***

## **Source Water For Your Aquaponics**

### **Chlorinated Water**

- ❖ Chlorinated city water is potable water by definition. It is relatively expensive, but you can safely use it for washing babies and drinking. Even filling up a big commercial aquaponics system for the first time only uses ten or twenty dollars worth of our chlorinated "city" water at current prices.

However, you want to be careful of adding large amounts of this (chlorinated) water to a system that has fish or vegetables or both in it. If your water tests positive for chlorine, you should put it in a separate "makeup" water tank for a day or two to burn off the chlorine before putting it in the system. We put 50 to 100 gallons a day of chlorinated water into our systems with no ill effect, as our chlorine level is low or unmeasurable. Measure your chlorine levels with test strips to be sure there is none before putting it directly into your system.

### **Chloraminated Water**

- ❖ **IMPORTANT! You must use a "total chlorine" test to test for chloramines** (NH<sub>2</sub>CL) in your "city" water. A simple "chlorine-only" test **will not** show the presence of chloramine; you can't smell it like you can smell chlorine, and so you **must use** chloramine test strips to tell whether or not you have chloramines in your water. Chloramine is increasingly being used to chlorinate water because it is less expensive, and does not dissipate as quickly as chlorine. Get test strips that test for both chlorine and chloramine, and test for **both** before you fill up your system so you know what you're getting into.

**When testing for chloramines**, make sure your test kit tests for "total chlorine" or "combined chlorine" or for "chloramine **and** chlorine", not just for "free chlorine". A test for "free chlorine" would misleadingly read zero in chloraminated water. You can buy a swimming pool test kit which tests for both chloramine and chlorine, which is the same but usually far less expensive than aquarium test kits. Chloramine is caustic: there are lawsuits all over Southern California from builders who had to replace all the piping in subdivisions they'd built because chloramines had eaten pinholes in the copper pipe they'd used.



**"Total" Chlorine test strips test for both chlorine and chloramines in your incoming water.**

**This is critical, because you may have water with toxic amounts of chloramines in it that won't show when tested with a "chlorine-only" test strip! Such water will kill your fish and plants!**

**Here's a trick to use** if you can't find "Total Chlorine" test strips, and you have ammonia test strips: test for ammonia. If you see ammonia levels of 0.5 to 3 ppm in water that shows "no" chlorine (when tested with a "chlorine-only test strip"), you can be almost certain that your incoming city water has chloramines in it. This is because the ammonia strip responds to the "amine" portion of the chloramine, and presents a positive ammonia reading, making it look like you have high ammonia levels in your system. You don't; you simply need to get a "total chlorine" test strip and try again.

**Chloramine does not out-gas as chlorine will** with aeration and sunlight, so you have to **actively remove it** from your water, **or wait days or weeks** for it to dissipate on its own.

**Here's what we recommend for active removal, if you find that you have chloramine in your water:** Many sources cite **ascorbic acid** (Vitamin C) as a neutralizing agent for chloramine (see Wikipedia article here: <http://en.wikipedia.org/wiki/Chloramine>). Here's a source for the NSF-certified chemical (National Sanitation Foundation certification) in quantity from the Integra Chemical Company: <http://www.vita-d-chlor.com/index.htm>).

**Do not use the "Vita-D-Chlor Neutral"**, as it is sodium ascorbate. The sodium atom in this compound will break away in water, and recombine with a free chlorine atom to form sodium chloride, AKA **salt**; that's bad for your plants!

**Do use the "Vita-D-Chlor Granular"**; it is ascorbic acid, and will neutralize chloramines if used according to their instructions for concentration and then mixed with your system water (or makeup water). You can neutralize all the chloramine in your system water easily with a one-time application of ascorbic acid when you start up your system, then simply wait two days before you add bacteria and fish for the ascorbic acid will neutralize all by itself (test for chloramines to make sure you're done!).

**After you initially fill and dechlorinate your system**, and are now operating a "live" aquaponics system, you will need to add water at irregular intervals to "make up" for water usage. Normally you would fill your "makeup water tank" with tap water, mix in ascorbic acid, and wait a couple of days for the ascorbic acid to self-neutralize. Yes, you need a separate tank for this if your water has chloramines in it, because you **cannot** put either chloraminated water **or** ascorbic acid into your **live** aquaponics system! If you **can't wait** several days to a week for the chloramine to self-neutralize before adding the makeup water to your system, you **can** neutralize the ascorbic acid in the makeup water tank. Wait for three or four hours after adding and mixing in the ascorbic acid, so it has a chance to neutralize the chloramine, then put a couple handfuls of calcium carbonate in with the new water and stir it around thoroughly, and you should be able to safely add the water to your system within three to four hours afterwards. Calcium carbonate is safe: it is coral sand or crushed oyster shell, which we use in our systems anyway to balance pH.

**Why do you need to neutralize the ascorbic acid if you're going to add the water right away?** Because ascorbic acid acts as an herbicide in your system; it will sicken or kill the plants and turn their roots black if you add water with high enough quantities in it.

**Some of our students say** they have successfully used Kordon AmQuel® Ammonia/ Chloramine Remover in their Micro Systems. Proceed **carefully** with this kind of product, as water conditioners made for aquarium use (as the Kordon product is) **do not** have certification for use in a food production system. We **do not** recommend their use.

## Brominated Water

- ❖ **IMPORTANT! (As If That Wasn't Enough!) Instead of Chlorine or Chloramine, Some Water Systems now use Bromine to sanitize their water!** You should check with your water department to make certain exactly what they're using to sanitize your potable water, and also check with them on the best way to de-brominate it, if you find that yours uses bromine. Bromine is toxic, just as chlorine and chloramines are, or else it wouldn't be able to kill the microorganisms in water that it is designed to get rid of. This means it is also toxic to you, your fish, and plants, even though it may be a small amount and only **slightly** toxic.

- ❖ **You can get Sodium Bromide test strips** from pool and spa stores to find out if you have it in your water. The US Navy uses up to 1 ppm of bromine to purify their water aboard ships; this bromine then breaks down into bromides in the water and in the human body. Bromides are used in quantities far greater than this for anti-epileptic, sedative, and diuretic drugs for human use, and are approved for this use by the FDA. **However, because of the sketchy information available on bromines in water, you need to find out if yours has it, and then make your own determination on it's safety to use in your aquaponics system, we can't tell you yes or no!**
- ❖ **WARNING: For Chloramine And Bromine-Purified Water!** If you are planning to sell organically certified produce from a commercial scale operation, make certain your organic certification agency will allow use of water purified with chloramines or bromines, and then removed with whatever your chosen method of removing them is, before you literally buy the farm, and get it in writing! We have been certified USDA organic by two separate large certification agencies with plain chlorinated water used to fill and top up our systems; we don't know if they'll approve the use of chloraminated or brominated water.

## Agricultural Water

- ❖ **Ag water can be ditch water out of a ditch**, or water out of a pipe that has come from some sort of an open water distribution system without treatment of any kind. It's PROBABLY okay to use as is. In reality, it can have anything in it, from deadly bacteria to fish disease vectors, or plant and fish parasites, and you need to be sure you have killed anything that's in it before you put it into your system. **IMPORTANT!** How you do this is to fill the system with whatever nasty agricultural water you have, and put in a quart of Clorox for every 600 gallons of system volume to get all that water sterilized. Turn on your pump and your blower, and run the system like that for two or three days, with the RAFTS OFF THE TROUGHS. Every living thing in the system should be dead at the end of the first hour or two. (You don't want to be downwind from this.) The next two or three days will blow and burn off the chlorine in the system, until you can test it with chlorine test strips and find none. Do the same to any ag water you add to the system later, unless you want some interesting problems to deal with. You MUST USE a makeup water tank separate from the system to dechlorinate any new water after it's tested negative for chlorine, then transfer this safe water to your system, because you CAN'T chlorinate the system again with fish and plants in it without killing it all.

**But, can't I use the clean water out of my nearby stream?** Stream water is deceptively clear and sweet smelling. I once drank water out of a clear stream, and then hiked a half-mile upstream to find a huge dead cow floating in a pool. Use the same precautions with stream water as you use with ag water.

## Well Water

**Well Water can be extremely clean and pure**, or can have heavy metals, toxic agricultural chemicals, and/or chemicals introduced by industrial processes nearby. Because of the wide range of possible contaminants and water quality in wells, it is up to **you** to determine if your well water is safe for use in your aquaponics system. The best way to do this is to submit a sample to a reputable testing lab and ask for **"the works"**. Test for everything possible that could be considered a contaminant or toxin. Then decide if you can decontaminate and use it. If you are planning to sell organically certified produce from a commercial scale operation, **make certain** your organic certification agency will allow use of your well water purified with whatever method you plan to use before you literally buy the farm.

- ❖ **WARNING: Bad Water!** If it's not "city water" or well water that tested clean coming out of the pipe you should treat it as Bad Water and chlorinate it as explained previously. You have no way of knowing and are gambling if you don't.
- ❖ If you are planning to sell organically certified produce from a commercial scale operation, **also make certain** your organic certification agency will allow use of your "Ag" water purified with whatever method you plan to use before you literally buy the farm. Does it sound like you should check out your water source and get it approved before you buy the farm? Yes!

- ❖ If you don't mind a little disease in your fish (because none of the fish diseases or parasites transfer to humans or plants) then you don't have anything to worry about when using agricultural water. Except getting a dose of Roundup or pesticide-laden water in from an unknown source like an irrigation ditch or stream that there was overspray into, and killing all your fish and plants. I know two Hawaii koi farmers who lost their entire ponds full of stock when herbicide-contaminated ditch water came through them. If you're using ag water, this is a good reason to have a makeup tank; chlorinate the water in the makeup tank, wait until it tests negative for chlorine, THEN put a few sacrifice fish into that tank for a few days to see if there are any herbicides or other poisons in the tank water, BEFORE adding it to your aquaponics systems. If they don't float after three days, the water's probably fine.

## Testing pH In Your Source Water

- ❖ **We have started systems with water having a pH as high as 8.3** with no seeming ill effects, so don't worry about it. The pH starts trending downwards immediately as the fish breathe CO<sub>2</sub> into the water and it transmutes into carbonic acid, lowering the pH. When the system pH is down around 6.2 or so, add calcium carbonate as mentioned in the section entitled **Nutrient and pH Levels**, and continue to monitor pH, adding calcium carbonate as necessary to buffer pH and bring it down.

**WARNING!** Do NOT try to bring down a high pH caused by highly basic water or by having a poorly neutralized concrete tank in your system by using **citric acid**! Citric acid is an organic **herbicide**, and will kill your plant's roots. They all turn black, then the plants all die (courtesy of one of our students whose name we forgot!). We do not **yet** have a safe and approved method of bringing pH down, just buffering it up with calcium carbonate.

- ❖ **You can use the little pH test strips**, or the pH pad on a "multi-strip" to test pH in your system; but we've found that those are often quite inaccurate: they will often show as much as 1.0 off what the pH actually was (measured with a pH meter accurate to .01!). If you have a commercial-scale operation, you **should have** a good pH meter. The **VitalSine pH meter**, available from Aquatic EcoSystems for around \$140, is the best one we've found. Despite the occasional bad review on the web, ours is rock-solid and dependable. In contrast, we got a Milwaukee pH meter for \$245 that had great reviews, and it's never been able to measure pH or even stay calibrated for more than about 10 seconds.



**A Vital Sine pH meter, about \$140 from Aquatic EcoSystems.**

**Allowing the probe to dry out for more than fifteen minutes or so can damage or destroy the probe's accuracy. When you use it, take all your readings (this will keep the probe wet), then when you are done, store it in the plastic cap filled with storage fluid right away!**

**Storing the probe end in the plastic cap with storage fluid inside is critical!**

- ❖ **When you buy the pH meter, you also need to buy** some pH calibration packets or fluid; this allows you to calibrate the meter so that you know your readings are accurate. **You also need to buy a quart** of pH

electrode storage fluid; this is what you put in the little screw-on cap on the probe to keep the probe moist while being stored. If the probe is out of the cap and dry for even a half hour, it can **destroy it. I've lost two \$90 probes to employees** who didn't put the cap back on.

- ❖ **We never leave the probe in a trough**, but put the meter and probe (in its little wet cap) in our test kit basket in a safe dry place every time we finish with it (even though the meter claims to be waterproof). We calibrate it every time we use it by dipping it into a packet of 7.01 Milwaukee calibration/buffer solution I get from Aquatic EcoSystems (30 to a box), then we **know** the readings are accurate. We rinse the meter probe before putting it in the calibration packet to calibrate it, then carefully close the top of the calibration packet and stick a clothespin on it to hold it closed, storing it upright in a dry location, so we can re-use the calibration packet as many times as possible.

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