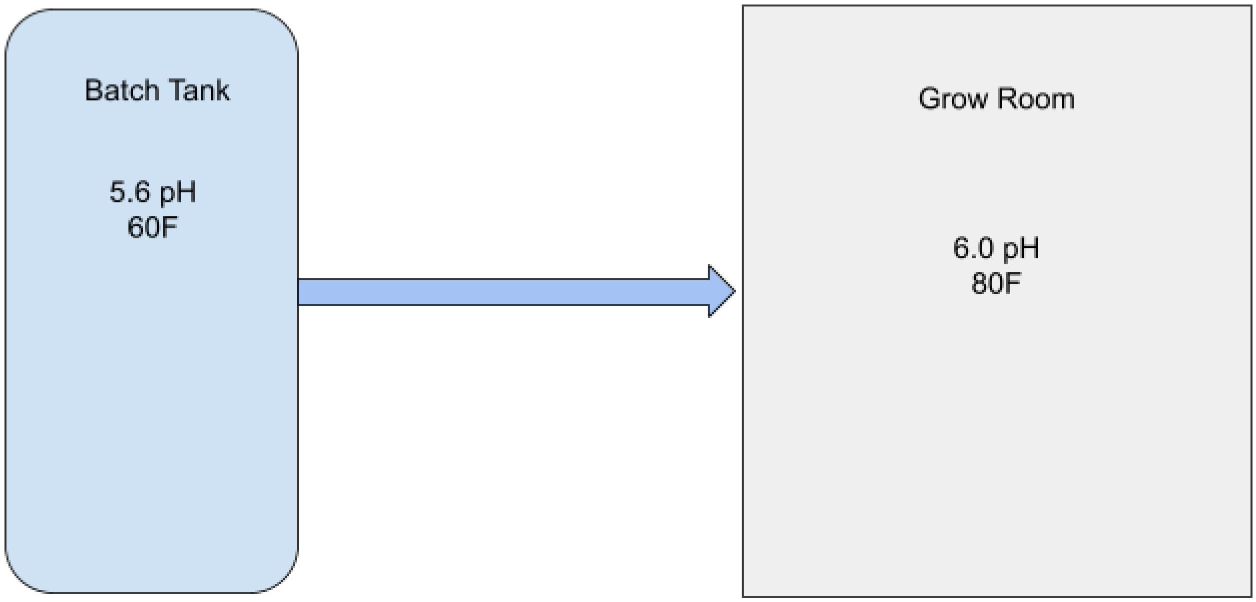

Why is my pH higher in the grow room than in my Batch tank?

<u>The "Why" Part</u>:

While most growers know that algae growth and other microbe activity within an irrigation system can affect pH, and that sufficient time is usually needed for pH adjusting products to fully react and come to equilibrium before measuring to give the true, final nutrient solution pH reading, those are not the only reasons that an increase in pH can occur from one point in the system to another.

Another lesser-known cause has to do with dissolved CO_2. It's well known in environmental research that as the ocean (or any water) absorbs more and more CO_2, its pH decreases. In chemistry terms, this is because dissolved CO_2 reacts with water to form carbonic acid ($CO_2 + H_2O \longrightarrow H_2CO_3$), which then dissociates into hydrogen (H^+) and carbonate (CO_3^{2-}) ions ($H_2CO_3 \longrightarrow 2H^+ + CO_3^{2-}$). The resulting free H^+ ions again react with the water to form hydronium (H_3O^+) ions, increasing H_3O^+ concentration. Since $pH = -\log [H_3O^+]$, when that concentration increases, pH goes down.

However, in cultivation facilities, typically it is this process in reverse, or the *<u>removal</u>* of CO_2, that is at play in pH changes from a batch tank to the drippers it feeds. Water can hold less and less dissolved CO_2 as it warms up, and during that warming, it gasses off, removing carbonic acid from the water and raising pH. For example let's say the water coming into the building that is used to make up a batch tank starts out at 55°F. Due to the low dripper/zone flow rates typically found in indoor grows, the water flows slowly enough that it almost always warms up to the same temperature as the air in the grow room by the time it reaches the plants, which is typically a good 80°F+. If that water had a high amount of dissolved CO_2, we would expect a rise in pH from the batch tank to the drippers. How large of a rise would depend on the quantity of dissolved CO_2 that the water originally had, and the difference in starting vs ending temperatures.

<u>How to Prevent Issues</u>:

A solution to this scenario is to allow the water to reach grow room temperature before adjusting pH, or by simply taking that measured pH rise into account and targeting a lower pH when initially mixing/filling batch tanks. We prefer the latter method in practice (measure pH at the dripper and adjust batch tank pH lower to compensate for the increase through the system), since sometimes waiting for 500 gallons of cold water to warm up isn’t feasible, and holding warm water increases the likelihood of microbial growth.

This is why it's so important to check the pH at the drippers and not just the batch tank. It is typically ok to have a batch tank pH that is ***lower*** than the 5.6 pH target for JR CropTech products, it will actually help keep your tanks and lines relatively cleaner than higher pH solutions would. As long as it hits the drippers at 5.6 pH, a lower pH upstream of that point is inconsequential to the plants. However, a pH ***higher*** than 5.8 is always a cause for concern, as calcium phosphate precipitation can occur much more easily above that pH (gets worse the higher you go), and that precipitation can clog filters/drippers.

On the microbial side, adding some peroxide or bleach (or any oxidizing agent meant for use in irrigation systems) to the tank when filling will usually help to keep it under control. Blacking out storage tanks that have any amount of light hitting them will also prevent a lot of growth, as will using schedule 80 PVC instead of schedule 40. If schedule 40 is used anywhere above ground, even just low-intensity hallway lighting can shine enough light through to allow algae to grow. If replacing existing schedule 40 pipes is not an option, painting them with a latex-based paint will also block the light (any color, just has to be latex-based).