Aquarium Water Management: Alkalinity vs. Water Hardness

Drs. Foster & Smith Educational Staff

Q. What is the difference between water alkalinity and general hardness? Why do I need to test these parameters?

A. Alkalinity, often referred to as "carbonate hardness," or German carbonate hardness, is the measure of carbonate and bicarbonate concentrations in your aquarium water. Alkalinity is a measure of the ability of a solution to neutralize acid without changing the pH. It both controls and maintains water pH. Carbonate hardness is measured in degrees (dKH), parts per million of calcium carbonate (ppm $CaCo_3$), or milliequivalents per liter (meq/L).

You should perform regular tests for alkalinity, because a low alkalinity can allow water pH to fluctuate, and cause undue stress for aquarium inhabitants. Maintain your aquarium's alkalinity in the range of 2-4 dKH in soft water, 8-12 dKH in hard water, and 7-10 dKH in saltwater aquariums. Be sure to use a quality buffer specifically designed for your water type to raise and maintain your aquarium's alkalinity. Fish have different preferences for alkalinity, for example, African mouthbrooding cichlids prefer a dKH of 10-17, while South American dwarf cichlids do best at 1-7 dKH.

In contrast to carbonate hardness, general hardness is the measurement of the total dissolved minerals in your aquarium water. Test kits generally measure the amount of calcium and magnesium salts present, and the result is expressed in degrees dH or dGH. This parameter is not critical in most aquariums, except those containing fish and plants with special requirements. For example, depending upon the types of plants, a freshwater planted aquarium may require soft water with a low general hardness in the range of 3-5 dH. Conversely, an African Cichlid aquarium requires water with a higher general hardness range of 10-15 dH. Saltwater is not tested for general hardness because calcium and magnesium levels are tested separately. Common terms for water hardness are somewhat arbitrary, but generally fall within the dH ranges shown in the table.

Water Type	dH	dKH
Very Soft	0-4	0-4
Soft	4-8	5-7
Slightly Hard	8-12	7-8
Moderately Hard	12-18	9-12
Hard	18-30	13-20
Very Hard	Over 30	Over 20

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