Ammonia from the gills of fish, their urine, and rotting food or decaying plant matter are contributors of ammonia in an aquarium.

It exists in two forms in the aquarium and the first step is to understand the difference between ammonium NH4 and free ammonia NH3.

NH3 (ammonia) is a gas and sometimes called toxic or free ammonia. This type of ammonia is the dangerous part.

NH4 (ammonium) is a nontoxic salt. It is the ionised form of ammonia.

NH3 and NH4 together are often referred to as total ammonia nitrogen (TAN).

Under normal conditions, NH3 (ammonia) and NH4 (ammonium) will both be present in aquarium water. The two exist at an equilibrium point that is governed largely by pH and temperature. However, salinity and the ionic strength of the water also influence this equilibrium point.

The chart below shows how the ratio between NH3 and NH4 is affected by pH in a controlled sample. As the pH increases, the ionised NH4 is liberated into gaseous NH3. As the pH increases there reaches a point where NH4 cannot exist and all ammonium is presented as NH3 ammonia; this is beyond the pH of normal aquarium life.

NH3-NH4 equlibrium.PNG

The green line on the chart below indicates the pH where a marine aquarium normally falls and shows that roughly 15% to 20% of the TAN is NH3 and the rest (80% to 85%) will be NH4. Therefore, when any ammonia (TAN) is present in a normal aquarium, the majority of it will be NH4.

Traditional test kits and photometers usually measure TAN or NH3-N and as such misinterpretations of what is being measured can occur. For more information please click here.