

## How to calculate your Un-ionized ammonia levels

Information below collected from:

Francis-Floyd, Ruth, Craig Watson, Denise Petty, and Deborah B. Pouders. "Department of Fisheries and Aquatic Sciences, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida." *Ammonia in Aquatic Systems I* FA.16 (1990). University of Florida, 2009. Web. 18 Nov. 2011. <<http://edis.ifas.ufl.edu/fa031>>.

Un-ionized ammonia (UIA) is about 100 times more toxic to fish than ionized ammonia. This UIA toxicity begins as low as 0.05 mg/L, so the result of the TAN test needs to be further calculated to find the actual concentration of UIA.

To do this calculation, the temperature and pH need to be measured. Once the pH and temperature are known, the fraction of UIA can be calculated using a multiplication factor found in [Table 1](#). Find the temperature on the top row of the table, and the pH in the left column. The number at which the appropriate column and row intersect in the table is multiplied by the TAN to give the UIA in mg/L (ppm). This calculation is summarized in [Figure 1](#) and an example is given in [Figure 2](#). Anytime the UIA is higher than 0.05 mg/L, the fish are being damaged. As the concentration rises above 0.05 mg/L, it causes more and more damage. At 2.0 mg/L, the fish will die. Again, *any* ammonia indicates a problem in your system. If you find it, take corrective measures immediately.

**Table 1.**

pH	Temperature													
	42.0 (°F)	46.4	50.0	53.6	57.2	60.8	64.4	68.0	71.6	75.2	78.8	82.4	86.0	89.6
	6 (°C)	8	10	12	14	16	18	20	22	24	26	28	30	32
7.0	.0013	.0016	.0018	.0022	.0025	.0029	.0034	.0039	.0046	.0052	.0060	.0069	.0080	.0093
7.2	.0021	.0025	.0029	.0034	.0040	.0046	.0054	.0062	.0072	.0083	.0096	.0110	.0126	.0150
7.4	.0034	.0040	.0046	.0054	.0063	.0073	.0085	.0098	.0114	.0131	.0150	.0173	.0198	.0236
7.6	.0053	.0063	.0073	.0086	.0100	.0116	.0134	.0155	.0179	.0206	.0236	.0271	.0310	.0369
7.8	.0084	.0099	.0116	.0135	.0157	.0182	.0211	.0244	.0281	.0322	.0370	.0423	.0482	.0572
8.0	.0133	.0156	.0182	.0212	.0247	.0286	.0330	.0381	.0438	.0502	.0574	.0654	.0743	.0877
8.2	.0210	.0245	.0286	.0332	.0385	.0445	.0514	.0590	.0676	.0772	.0880	.0998	.1129	.1322
8.4	.0328	.0383	.0445	.0517	.0597	.0688	.0790	.0904	.1031	.1171	.1326	.1495	.1678	.1948
8.6	.0510	.0593	.0688	.0795	.0914	.1048	.1197	.1361	.1541	.1737	.1950	.2178	.2422	.2768
8.8	.0785	.0909	.1048	.1204	.1376	.1566	.1773	.1998	.2241	.2500	.2774	.3062	.3362	.3776
9.0	.1190	.1368	.1565	.1782	.2018	.2273	.2546	.2836	.3140	.3456	.3783	.4116	.4453	.4902
9.2	.1763	.2008	.2273	.2558	.2861	.3180	.3512	.3855	.4204	.4557	.4909	.5258	.5599	.6038
9.4	.2533	.2847	.3180	.3526	.3884	.4249	.4618	.4985	.5348	.5702	.6045	.6373	.6685	.7072
9.6	.3496	.3868	.4249	.4633	.5016	.5394	.5762	.6117	.6456	.6777	.7078	.7358	.7617	.7929
9.8	.4600	.5000	.5394	.5778	.6147	.6499	.6831	.7140	.7428	.7692	.7933	.8153	.8351	.8585
10.0	.5745	.6131	.6498	.6844	.7166	.7463	.7735	.7983	.8207	.8408	.8588	.8749	.8892	.9058
10.2	.6815	.7152	.7463	.7746	.8003	.8234	.8441	.8625	.8788	.8933	.9060	.9173	.9271	.9389

Figure 1. Step-by-step guide to calculating unionized (toxic) ammonia. UIA of 0.05 mg/l may harm fish. As UIA approaches 2.0 mg/l fish will begin to die.

<b>Step 1</b>	Use a water test kit to measure ammonia. The number from the kit is the TAN (total ammonia nitrogen).
<b>Step 2</b>	Measure the water temperature.
<b>Step 3</b>	Measure the water pH.
<b>Step 4</b>	Find the multiplication factor in Table 1 using the water temperature and pH readings.
<b>Step 5</b>	Multiply the TAN (Step 1) and the factor from the Table 1 (Step 4). The answer is your unionized ammonia (UIA) in mg/l. If the number is larger than 0.05, the ammonia is harming your fish.

Figure 2. Example of how to calculate UIA using the factors in Table 1.

<b>Step 1</b>	Your TAN measured with a text kit is 1.0mg/L (or 1.001142303 ppm)
<b>Step 2</b>	Your water temperature is 75 F (24 C)
<b>Step 3</b>	Your water pH is 8.0
<b>Step 4</b>	Based on your water temperature and water pH the factor that you multiply by from Table 1 is 0.0502. (This is where the pH in the left hand column intersects the temperature listed across the top of the table)
<b>Step 5</b>	TAN X Factor from Table 1 = 1.0 X 0.0502 mg/L = 0.0502 mg/L UIA
<b>INTERPRETATION</b>	The un-ionized ammonia (UIA) present is 0.050 mg/L. This level is high enough to cause some gill damage. If UIA is allowed to increase, the fish will be under considerable stress.