# Laboratory Test to Prove the Efficacy of Ammo Lock® using fish cell tissue cultures in the presence of ammonia

*Study performed at the University of Georgia, School of Veterinary Medicine, Department of Medical Microbiology*


## INTRODUCTION

Ammonia is produced from the waste of fish and invertebrates. Ammonia is also released from the gills of fish during osmoregulation as well as from bacterial decomposition of excess food, decaying plant material and decomposing animal material. The majority of the ammonia entering the water from fish is diffused through the gills. Regardless of the source, ammonia is problematic to all living organisms in high amounts. The lethal effects of exposure to ammonia in fish are severe gill damage leading to suffocation, kidney damage due to inability to osmoregulate, and the increased inability to secrete ammonia from the body resulting in metabolic and physiological imbalance. Even at low levels, ammonia problems are documented in reduced growth rate and damage to gill filament tissue.

Ammonia exists in two forms, namely, un-ionized ($NH_3$) and ionized ($NH_4+$). Both forms are measured together and are referred to as total ammonia. (All test kits in the aquarium and pond industry only read total ammonia.) The levels of ammonia are reduced by biological filtration and, provided everything is in balance, the ammonia should be zero. The design of the aquarium, amount of fish and feeding regimen all affect the ammonia concentration.

Short-term exposure of fish to high levels of ammonia results in increased gill damage, loss of equilibrium, convulsions and then death. Continuous exposure to low levels of ammonia leads to increased tissue damage, decrease in reproductive abilities, poor growth, and increase in susceptibility to disease.

## METHODS

The first stage of the test was to prove that AMMO LOCK caused no adverse effects to live fish cells. Under controlled conditions, live fish cells were exposed to a 10 times recommended dose of AMMO LOCK

The second stage of the test was to prove that AMMO LOCK protects live fish cells from the toxic effects of ammonia. Under controlled conditions, live fish cells were exposed to 5ppm (mg/L) of ammonia. Then a single dose of AMMO LOCK was added to fish cells with 5 ppm (mg/L) of ammonia.

During each stage, pictures of the cell culture were taken to clearly show the damage or protection of the live fish cell tissue cultures.

The degree of protection of fish cells was rated on a scale of 1 to 4. A rank of 1 indicated complete protection and a rank of 4 indicated destruction of the fish cell culture.

## RESULTS

The first stage of the test showed continued tissue growth in the presence of a 10-times dose of AMMO LOCK as noted in Photo 1.

The second stage of the test showed that live fish cell cultures in the presence of 5 ppm (mg/L) of ammonia lost their cellular structure and died as evident in Photo 2. The study also showed that when healthy live fish cell cultures were exposed to 5 ppm (mg/L) of ammonia with a single dose of AMMO LOCK added the live fish cells continued to grow normally as evident in Photo 3.

## DISCUSSION

Levels of ammonia as low as 5ppm (mg/L) adversely affect fish cells. Damaged fish cells interfere with the uptake of oxygen, release of carbon dioxide, and all physiological functions essential to maintain proper health. Injuries to gill cells will result in labored respiration and suffocation. The test results proved that AMMO LOCK can protect fish cells in the presence of toxic ammonia. The test also proved that AMMO LOCK is safe to aquatic life.

It is important to remember that chronic exposure to even relatively low levels of ammonia cause stress, physiological imbalance and increased susceptibility to disease. When ammonia is detected, the source should be determined. If ammonia is constantly present, even in small amounts, it implies that the biological filter is not large enough, or is not working properly, and should be serviced. Whatever the source of ammonia, AMMO LOCK will protect fish from its toxic effects by instantly neutralizing it.

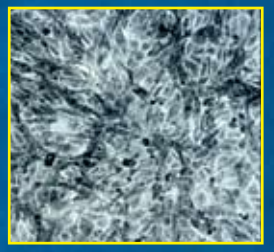

*Photo 1- A healthy fish cell culture exposed to a 10 times dose of AMMO LOCK*

*Photo 2- A dying fish cell culture, the result of exposure to 5ppm (mg/L) of ammonia.*

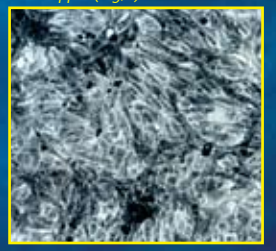

*Photo 3- A healthy fish cell culture exposed to 5ppm (mg/L) of ammonia with single dose of AMMO LOCK.*

Reference –

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