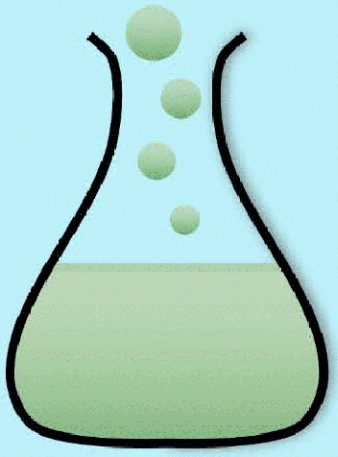
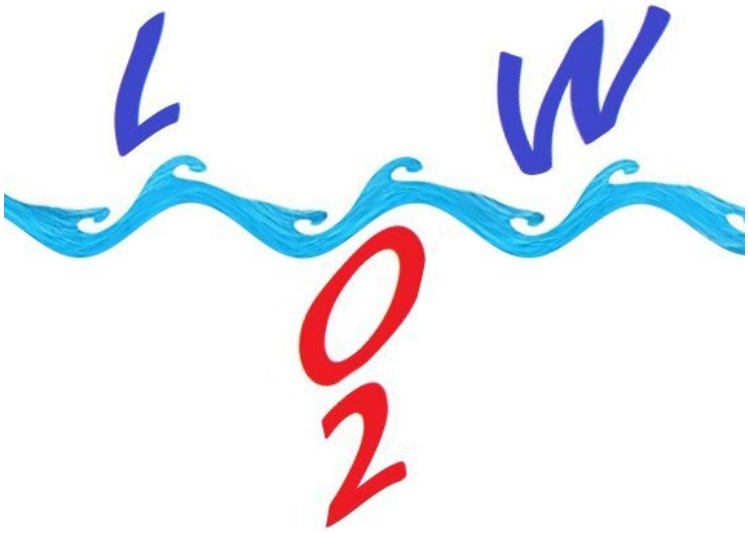
Low O2



Improving Medicinal Treatment of Pet Fish

https://reverserespiration.com

LOW O2



I thought this relatively new data were really interesting.

The USDA, in conjunction with two independent laboratories in New Zealand and Sweden along with three fisheries on the Snake River in Idaho, performed one of the most comprehensive studies on oxygen deprivation while medicating fish I've seen.

The study is vast (almost 400 pages of data!) and examined hundreds of parameters, *but* in this instance, what seemed to hold potential benefits for an aquarist--a portion of the study was on *the effects of adding aeration vs supplemental oxygen to fish tanks during illness, while being medicated and to offset environmental stressors.*

The objective was to determine if increasing the dissolved oxygen would raise the efficacy of medicinal treatments and/or improve mortality, as well as to determine if other stress factors shared similar weight in the efficacy of treatment.

In typical aquariums with some exceptions, 7.5PPM-8.5PPM of oxygen is considered normal and healthy. In this experiment, they stocked rainbow

trout (125g avg. weight) into tanks with three different values of dissolved oxygen.:

- Tanks' average dissolved oxygen concentration was at 7.5PPM. Survival and medicinal treatment efficacy were averaged at **88%** in the 7.5PPM tanks.

- Tanks' average dissolved oxygen concentration was at 6.5PPM. Survival and medicinal treatment efficacy were averaged at **68%** in the 6.5PPM tanks.

(*A third test was done with oxygen at only 4.5PPM but I've not included that as that level of oxygen would not normally be present in a home aquarium*).

Considering that some medications can drop the tank O2 as low as 6PPM (see chart below), the 20% increase in mortality observed with the 6.5PPM tanks certainly underscores the need to keep the O2 high when using medications!

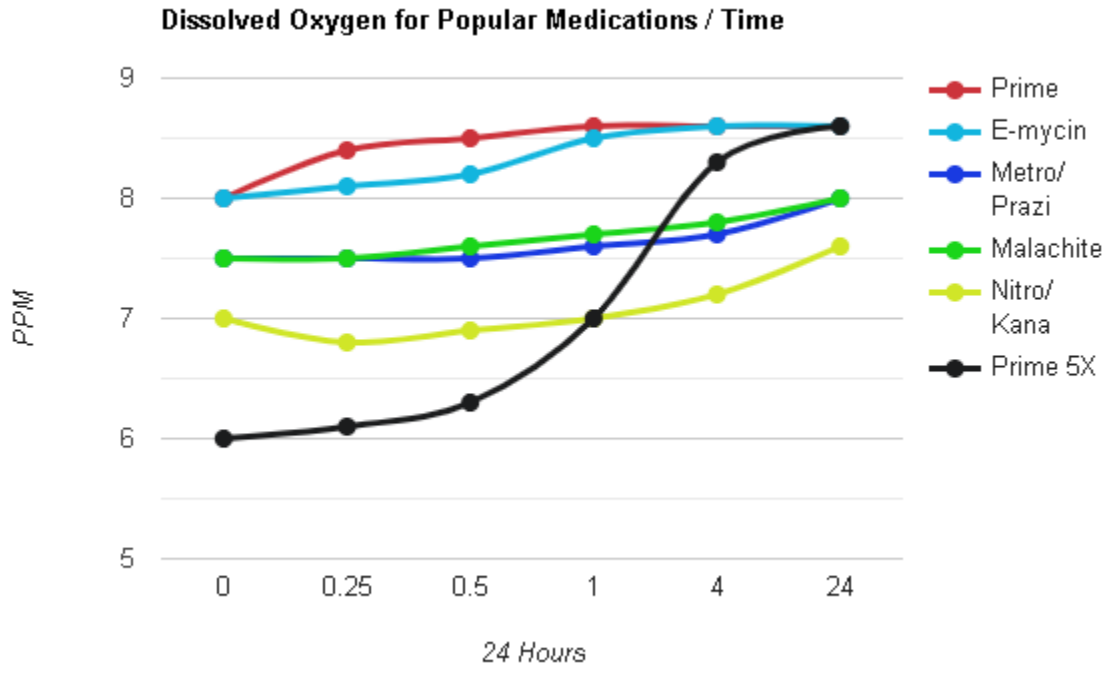
They then administered what they considered 'maximum aeration'. Survival and medicinal treatment efficacies rose, but to a disappointing amount:

- Survival and medicinal treatment efficacy were averaged at **93%** in the 7.5PPM tanks.
- Survival and medicinal treatment efficacy were averaged at **74%** in the 6.5PPM tanks.

Notice the fish raised in 6.5PPM & 7.5PPM only benefitted about **5%-6%** or so *from aeration during treatment*. That is, the Oxygen levels were essentially fully normalized once aeration was applied. In fact, O2 levels reached complete normality with simple aeration alone.

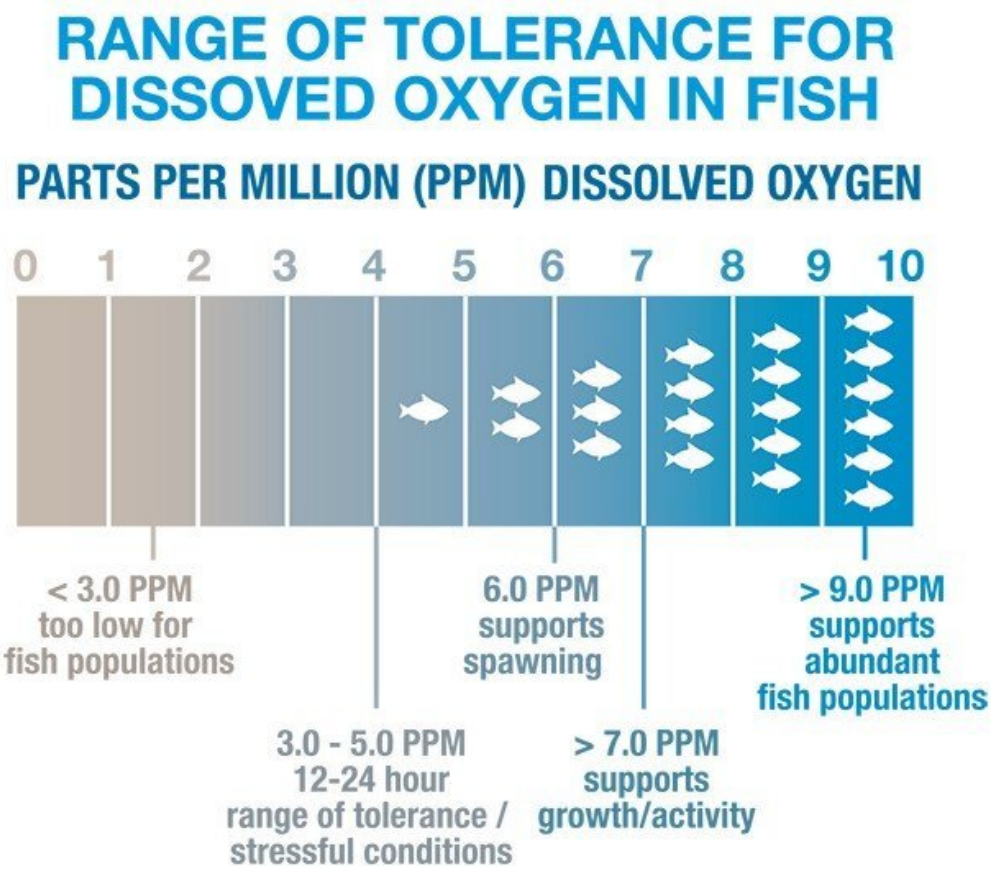
(Their test was taken over a 120-day period).

As above, in a typical aquarium, just simple aeration will almost fully offset these oxygen losses from some commonly used medications known to suppress dissolved oxygen. Charted below are six tanks treated with some common medications most of us have used at the default dosages. The O2 level of this water before adding any chemicals was 8.5PPM:



The one exception of the medications I've tested being *nitrofurazone*. Without aeration, it dropped O2 levels to borderline stressor levels (<=7PPM), *but* simple aeration raises and maintains it to/at 7.5PPM. However, unlike the other popular meds in the graph, O2 levels drop <u>again</u> as soon as aeration is ceased. Unlike all others in this limited test, nitrofurazone keeps the O2 down for at least 48 hours if not more (I only tested up to 48h). Only water changes rectified this.

Notice Seachem Prime's O2 depletion infamy is quite short lived. In just 15 minutes, most of the O2 has normalized and fully so inside of an hour. However, the Prime 5X 'emergency dose' drops O2 to near dangerous levels. So, aeration is imperative.



Although aggressive aeration brought the O2 to normal levels, *it didn't affect the outcome of medicative stress, recovery or mortality very much.* But they weren't done with this concept.

As aeration proved to assist in treatment recovery of only 5%-6%, the Snake River facility partnered with two university laboratories below to test if *super saturation* of the tanks with oxygen (hyper-oxidation) would in fact improve the recovery from disease, improve medication tolerance and reduce mortality.

HYPEROXIDATION

But what if aquarium oxygen is raised *above* saturation? If circa 7.5PPM oxygen is normal and healthy, what effect *if any,* does hyper-saturation of the aquarium with oxygen to say, 9PPM or 10PPM have on sick fish being treated with common medications? It's easy to do, but is it worthwhile?

Their findings were surprising and *potentially* valuable to us.

A study done by the Universities of Auckland and Gothenburg cites observances of medicated fish with supplemental oxygen. It was found that an astounding leap in reduced mortality and medicinal treatment efficacy occurs when the tank is flooded with oxygen.

The tank had its oxygen levels raised *above* normal oxygen levels (circa 7.5PPM) and held to 9PPM-10PPM during treatments. Unlike the 5%-6% improvement in illness treatment with aeration alone, once the O2 was temporarily raised to between 9PPM and 10PPM, the outcomes changed dramatically:

- Increased metabolism.
- It was observed that a small but significant percentage of severely ill fish that were refusing food began to ingest small amounts of medicated foods after being hyper-oxidated for 24-48 hours.
- Improved ability to endure most common stressors.
- Improved a fish's temperature tolerance substantially.

On average, hyper-oxidation of the tanks reduced mortality during various medicinal treatments by 38%! It also increased the success rate of treatments by the same amount or greater!

(Most of the treatments in these tests were deworming's so unfortunately, no data was presented for antibiotic treatments as these fish are raised for human consumption and the USDA limits antibiotic use. However, some of their tests did in fact include “unapproved” antibiotic treatments but the antibiotics used were not specified).

The elephant in the room now would be to examine if raising the tanks O2 to hyper-saturation levels would or even could do any harm. To that end, the next observation should be if in fact there are any adverse observations on hyper-oxidation.

They list the following as positive to neutral;

- Had no effect on fry or juvenile growth.
- Insignificant rise in *resting metabolism* but quickly returns to normal once ceased.
- Substantially increases *metabolism under stress.**
- Increased aerobic capacity and cardiac performance.

- Dramatic improvement in temperature variation tolerance.

**I'm speculating here* but this observation seems to me that it might prove the most important of all these benefits for weak or stressed fishes, especially while being medicated.

An interesting note here. Well into the study is this most odd finding. I wish they provided more information. The statement below is from the study but offers no explanation so I'm simply quoting it here verbatim:

"Hyperoxidation of the tanks significantly assists in penetration and kill-off of anaerobic methane pockets, especially in sand and finer gravels."

I wish there were more information provided on that one!

With a simple DIY addition, you can hyper-saturate your tank with oxygen. It may help fish recover from disease and tolerate medications and has no known adverse effects.

A simple, Hydrogen Peroxide degassing rig for removing the O2 from peroxide and delivering it to the tank with zero risk of toxicity is linked below. This simply degasses the O2 out of the peroxide and you pump it into the tank with an airstone.

If the amounts of peroxide, the bucket size and air pump are used as listed, it will hyper-oxidate your tank to 9PPM-10PPM for two days:

Degassing Peroxide

Of course, with techniques such as these, you'll never truly know if it helped! But O2 can't hurt (many thanks to my forum buddies for their input) and a potential 38% improvement in recovery from illness in their tests may make this or some more sophisticated equivalent of this worth trying, especially if you're experiencing fatalities, or recovery is slow or incomplete.