Good Vibrations

An Experiment in Treating Swim Bladder Disorder in Pet Fish

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A Potential Electronic Alternative for Treating Swim Bladder Disorder from Constipation

My experience in aquatics is relatively inexpert. Most people on aquarium forums are far more advanced and have much more experience than I do with fishkeeping.

I preface this report with that statement in order to illustrate why the experiment below is nonconclusive. It has far too few samples and controls for a scientifically sound test. Nonetheless, the results I saw, coupled with the often-urgent need for a resolution of this issue, may make it worthwhile for people to try this technique if and when they are faced with this common, often fatal dilemma.

A brief history may help illustrate how this came to be.

I have experienced two severe disease outbreaks with new mail-ordered fish. Before these two incidents, the worst pathogen I faced was mild ich.

I had placed an order for some juvenile fishes--12 silver dollars, 4 dojo loaches, and 10 electric blue acaras. I intended to grow out the silver dollars as dither fish for my very large and now infamously aggressive oscar:

Just Oscar (1m 46s)

When they arrived, 5 silver dollars were DOA and the remaining 7 were white, as if painted. The EBAs were alive but similarly ‘painted white,’ and the dojos had what *appeared* to be severe fin rot.

I began more traditional treatments, but it only got worse, and new deaths were almost a daily occurrence. I contacted my friends on a forum, and as usual, their advice was beyond helpful and sympathetic.

I had never seen an outbreak of any kind this aggressive and fast. Overnight changes were devastating.

Giant, red ulcerated sores would appear in just hours, and the fish looked to be suffering greatly. The white columnaris morphed into these open, red sores. He suspected this was some sort of flesh-eating bacterial infection and recommended I immediately switch to much more powerful antibiotics.

He proved correct in recommending I abandon the ‘mild’ drugs I was using and immediately go to a much more powerful combination of metronidazole, kanamycin and nitrofurazone, as it appeared to him to be severe columnaris and/or worse.

In just 3 days it ceased progressing. The sores began to heal, and the white patches began to fade.

However, another problem began, one that is not uncommon to most of us. Although the sores were healing, the fish stopped eating entirely. They began to bloat, and many were developing what appeared to be a **swim bladder disorder due to constipation**.

This was particularly acute with my dojo loaches. No matter how they fought it, they would float to the top with swollen bellies and could not eat. Some tried but spit out whatever they attempted to eat.

As they could not eat, it prevented medicated food or high fiber foods from being an option, so I had to treat the whole tank. I have in the past had great success with minor bloating, constipation and the resulting swim bladder instability by treating the tank with 1tbps/10 gallons of Epsom salts with *not one negative reaction and nearly 100% success*.

But I had never done so on scaleless fish. This was **not** tolerated well by the dojos. The Epsom salt dosage above made them frantic to get out of the water, so I reduced it immediately at a friend’s recommendation. About ½ that dosage they seemed to tolerate. They hid behind filter outputs, but they didn’t appear greatly distressed. But I also didn’t know if it was strong enough to help with them passing any intestinal blockages that they seemed to have built up after two weeks on strong antibiotics.

Unfortunately, it was not. They continued to suffer severe buoyancy problems and refused food. And a stronger dose of Epsom salt was now out of the question.

Sonotherapy

I had thought about some sort of *physical massage*. But to be honest, I was scared to attempt it as I simply do not know enough about their physiology. I may hurt them, *I'll certainly stress them*, and frankly, they'd been through hell already, so the stress factor was prominent in this equation.

A friend who happens to be a veterinarian helped review this document before I posted it and offered the following addition to help illustrate the potential of an electronic massage, or **sonotherapy,** when she has encountered severe constipation in some animals:

> *"We sometimes strap, ahem, "vibration devices", to tortoises and other reptiles that have sand impactions or constipation to loosen the fecal material. I think your sound waves may have loosened the fecal material and allowed it to pass. Especially in combination with the Epsom salt. The Epsom salt draws fluid into the GI tract when dosed in people. Fish swallow water, therefore, the salts may have softened the fecal material. It can also be absorbed through the skin and certainly through the gills. Magnesium is also important in muscle function so the Epsom salt may also benefit in that regard. I suspect it was a whole combination of things, but sound waves can certainly have significant effect on tissues and a variety of materials."*

Being mindful that this had gone on far too long and trying to weigh how much more I would subject these poor creatures to, I decided on *an electronic massage with sound waves,* or **sonotherapy.** It seemed innocuous, and at worst, would do nothing---and it is extremely simple to employ.

At this stage in the epidemic, one silver dollar and 4 dojo loaches were afflicted. I should note that the silver dollar may not have had the same affliction---he spun in circles, out of control of his movements. He did not float as typical swim bladder often manifests, nor was he upside down, but rather, he spun in uncontrollable circles; it almost appeared neurological. I put a tank divider in and sandwiched him in a gap between it and the tank wall so he could remain upright which seemed to give him some peace.

The 4 dojos, however, were ballooned and unable to control buoyancy: but for all of them, no eating, no pooping---just ever-increasing ballooning.

What I used was a common, inexpensive Bluetooth loudspeaker designed for showers and swimming pools. These little devices are about the size of a tennis ball, cost around $12, and will play under water. Once charged, you simply drop it in the water and play the appropriate noise.

Bluetooth Shower Speaker, IPX8 Waterproof Speaker Portable Hi-fi Audio

The Brown Noise

After that dark prelude, I should lighten things up a bit before proceeding. For my fellow *South Park* fans, an old episode called *"The Brown Noise"* tells the story of how Eric Cartman (the world's most sociopathic 4th grader) discovers that if the right note was played on a flute, anyone who hears it would crap their pants. Cartman then proceeds to stalk unsuspecting adults to play *The Brown Noise* in the most public and embarrassing situations to wreak havoc…and well, reeking in general!

The Whole World Pooping at the Same Time – South Park Studios

Returning to these afflicted fishes, I dropped the Bluetooth waterproof loudspeaker above into the tank and played a specific frequency (set to Repeat) I found on YouTube:

40Hz Audio Test Tone

Unfortunately, from here on is entirely speculation, so please accept this as nothing but that. I cannot tell you with any authority that this worked, but I can tell you what I observed. Overnight, 4 of the 5 afflicted fish were essentially emptied. Fecal matter was everywhere and the bloating on the silver dollar and 3 of the 4 dojos was gone.

One dojo did not improve. He looked terrible and had been through so much already, so I euthanized him. The silver dollar lost all bloating and pooped volumes, but he still spun uncontrollably. Again, my knowledge of their physiology is too limited to assert anything, but it just appeared neurological rather than swim bladder. I felt he'd been through enough and I put him down also.

However, the other 3 dojo loaches fully recovered and are in this display tank to this day:

Dojos with Severums (60s)

Now considering these fish were in Epsom salt, albeit a half-strength dose, it certainly may be a factor here*. However, none of these 5 fish released any fecal matter until the sonotherapy was applied.*

Once again, I'm well out of my ken here when speaking of physiology, but I did do some digging on what might have occurred.

There seems to be two potential mechanisms in play here---one being **peristalsis** and the other **resonance**.

Peristalsis is the natural rhythm of digestion---the frequency that the muscles pulse to move matter along the digestive track. This occurs at specific frequencies, or pulses, per second.

Sonotherapy is not an uncommon treatment for constipation in humans and animals. It is largely based upon simulating the natural peristalsis frequency and therefore adding to its innate power to move fecal matter along the track.

In August 2022, a nanotechnology-based pill that vibrates at human peristalsis frequencies was released, and initial tests have yielded an impressive 60% improvement in relieving human constipation.

FDA grants marketing authorization for Vibrant®, a new first-in-class, drug-free treatment for adults with chronic idiopathic constipation - Vibrant (vibrantgastro.com)

As one would expect, the vibration frequency of peristalsis varies species to species and is affected by the physical size of the animal, amongst many other factors. To that end, and this is a major generalization, but for example, a human intestinal peristalsis frequency is typically under 1 cycle per second or 1Hz, whereas a dog (a beagle in this study) and mice exhibited much higher peristalsis frequencies:

Efficacy and safety of vibrating capsule for functional constipation (VICONS): A randomised, double-blind, placebo-controlled, multicenter trial (thelancet.com)

Safety and Efficacy of a New Smartphone-controlled Vibrating Capsule on Defecation in Beagles | Scientific Reports (nature.com)

TIP imaging system (mice). | Nature Communications

In my limited research on this subject, I came across one study performed on fish: in this case, **trout**. Trout exhibited substantially higher peristalsis frequencies on the order of 8Hz or so, some 800%+ higher (faster) than humans.

Enteric reflexes and nitric oxide in the fish intestine - PubMed (nih.gov)

To return to the dojo's dilemma, I placed the speaker in the water and played an 8Hz tone into the water in order to emulate the above stated peristalsis frequency. This effectively vibrates the water at 8 times per second or 8Hz. But I noticed no reaction whatsoever. It manifested as essentially a *small wavemaker.* I tried this for half a day but decided upon another route because frankly, I'm far more familiar with physics than physiology---*resonance.*

As I did not know if stimulating a fish's peristalsis would work or not, and as I know next to nothing about their physiology, I treated the intestinal blockage not as a physical ailment but *a mechanical blockage.*

Clear as a Bell

Please bear with me here as I'll try to be succinct. Everything in the universe vibrates at its natural frequency known as its resonance. When you strike an object, the tone of the sound you hear is its resonance---the energy you've imparted by striking the object is converted into a form of energy that most easily transmits through *that* object. The most obvious example of resonance is striking a bell. The energy you've imparted when striking the bell is converted to the bell's natural resonant frequency and vibrates as *that* frequency, or, what you hear. Wind chimes are also a great

example, as the low frequency of the blowing wind is converted to the high pitch of the chimes.

To that end, I proceeded to look into any data on *the resonance of impacted fecal matter in animals*. And I was frankly shocked at how much research has been done on this!

As this dialogue has already gone on far longer than I had planned, I'll just highlight what I found on fish. Impacted fecal matter, being tighter and harder than normal, resonates at a much higher frequency than healthy matter. Said another way, it's stiffer and harder. Therein lies the problem.

Rather than trying to stimulate the fish's natural peristalsis frequency, I tried using a much higher frequency to essentially 'vibrate' the impacted matter until it broke up and passed more easily, not unlike what is described in this paper:

Efficient Array Design for Sonotherapy - PMC (nih.gov)

In our case, that frequency is determined by a combination of the sound's properties in water and the tank size. In this case, a 29-gallon QT tank was used.

As I didn't know what the optimal vibration frequency would be, I tried a *sweep frequency* first, which is a tone that varies from slow to fast vibration frequencies and back, cyclically. However, in a 29-gallon tank, dipping my hand in the water I could easily feel that the greatest vibration in the water was at around 40Hz so I elected to use that, as I could feel with my hand that 40Hz imparted the most energy into the water.

We now exit the world of physics and reenter the unknown (at least it's unknown to me). I played the above YouTube video of a 40Hz tone. Almost any tone imaginable is available for free on YouTube as "audio test tones." So, it's easy to try different tones and feel the water to see which one vibrates your tank the greatest amount.

In resonance, for the most part, the larger the object (tank), the lower the vibration frequency should be. For example, the 29-gallon optimized at 40Hz, but a 10 gallon would optimize at a higher frequency and a 55 gallon, lower etc. Almost ANY frequency is available on YouTube so it's easy to find the vibration frequency best for your tank.

I slowly raised the speaker's volume and watched carefully, ready to shut it down immediately. What I was watching for was panic or distress, but the opposite occurred. The fish clearly exhibited less stress. They hid less and seemed calmer, tried to swim and appeared more comfortable.

As all looked well, I let it run overnight. As previously mentioned, the following morning fecal matter was everywhere. The bloating was gone in 4 of the 5 afflicted fishes; and for some unknown (to me) reason, they actually seemed to gain some comfort from the sound. I could be anthropomorphizing, but what I can say with certainty here is *it clearly relaxed them.*

I cannot tell you if sonotherapy stimulated their peristalsis, if it relaxed them into releasing fecal matter, or if it broke up impacted fecal matter; nor can I say how much of this was due to the low dose of Epsom salts alone, *although in this instance, the latter had no visibly apparent effect until the sonotherapy was applied.*

What I can assert is that it did no harm and there's ample precedent to suggest it may have worked. Something or some combination of these things worked, and the total cost was about $12.

Much of the above might be incorrect or incomplete. I don't know enough, nor did I perform enough tests to assert otherwise. After this debacle, I hope to never find out, frankly. However, should you find yourself in the unenviable position of dealing with severe swim bladder from constipation, for me at least, this largely seems to have worked.

However, I do hope to learn more about what I witnessed in the sense of relaxation. Again, it could be my own projection, but I was expecting panic and instead I saw a general sense of calm come over the inhabitants. That alone could make this inexpensive and easy to implement sonotherapy worthwhile if indeed it was the case.

Thanks so much to my forum friends for reviewing this document for errors!