Stress.

Stress: a pre-condition for disease. Over and over, scientists tell us "many pathogens do not appear until the fishes are under stress from handling, crowding, poor nutrition or poor water quality" (McCann). Constant stress predisposes fish to attack by disease organisms. Stress can come from fluctuations in the environment that extend beyond the natural range of tolerance each species has evolved to handle. Or stress can result from pressures of aggressive tankmates. Each alarm reaction releases adrenal steroids that trigger a burst of energy but at the same time depress the immune system. Precisely how this happens, through the release of specific cortico-steroids, is now beginning to be understood: read Beverly Dixon's article **"Stress and fish disease,"** archived in the Reference section at *Aquarium Frontiers*.

Inauthentic analogies of "stress." When people misapply the idea of "stress," however, everyone can get confused. Here's a potentially misleading statement, taken from a good book on fish diseases: "Not only human beings, but also fish suffer from stress." We run a risk sometimes of applying to fishes our human conceptions of stress and imagining some stresses that don't apply to fishes. Loose thinking about "stress" is sometimes encouraged by self-serving marketing jargon, blurbs on various patent medicines and all-purpose snake-oil panaceas, and the brand-names themselves.. Don't just be drawn in. Be skeptical!

For example, if I say, "pressure leads to stress," you'll intuitively agree. Social pressure surely leads to stress of the psychological kind. In a tank, subordinate individuals are not always able to keep a sufficient distance from dominant ones, and an unnatural level of stress can result. But we can extend this concept of stress too far, building on analogies with our own projected reactions to comparable situations.

But what about stress resulting from osmotic pressure. I've just been reading on the web, "Salt adds electrolytes, which reduce osmotic stress to the gills." You've heard similar statements so often that they must be true, eh? Osmotic pressure is the gradient between concentrations of a solute ("electrolytes" being the ions in that liquid) on either side of a semi-permeable membrane. Gill surfaces and all cell walls are semi-permeable membranes. Osmotic pressure keeps the cell walls taut. To equalize the osmotic pressure, you'd need water with an electrolyte concentration equivalent to blood: brackish water, in other words. This pressure/stress analogy is a false one. The para-scientific "explanation" that leads to recommending salt as a "relief" from osmotic pressure is based on a false analogy. (More rant on this bugaboo of mine is elicited by **misusing salt as a medication.**)

In an example comparable to osmotic "stress," you'd never say that atmospheric pressure leads to stress. You wouldn't want to be "relieved" from the "stress" of atmospheric pressure! "Open the pod bay door, Hal!" Almost without exception, when you read that a medication is "designed to relieve stress", the ingredient being refered to is no more than common salt (NaCl), and the "stress" is the imagined result of osmotic pressure. And watch out for that phrase "designed to:" it's a common loophole, the trick being that as long as the preparation was "designed to" have such-and-so effect, intentions were honorable, which is what counts in law, even if the preparation turns out to be utterly ineffective in practice. Several very widely-distributed aquarium hobby suppliers indulge in this kind of shady advertising. Take note of them. Personally, I resent buying any product sold to me in this style.

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