

ChitoVan™ Lactate – General Description & Toxicity

Cascade EcoSolutions has introduced a powerful new natural water treatment agent called ChitoVan™ Chitosan Lactate. This product is a combination of chitosan and lactic acid (milk acid) and is offered as a dry flake product designed to dissolve in water and coagulate suspended sediment. We also offer several devices for accurate and variable dosing with our Lactate Cartridges©.

Why is dirty water bad for the environment?

| Relationship of suspended solids to fish health | |
|---|---|
| < 25 ppm suspended solids | No harmful effects on fish |
| 25-80 ppm suspended solids | Good-moderate fisheries but diminished yields |
| 80-400 ppm suspended solids | Unlikely to support good fisheries |
| >400 ppm suspended solids | Only poor fisheries are likely |
| | |

Whenever proposing the use of chemicals in the environment (water treatment agents, pesticides, herbicides, etc.) it is important to determine toxicity. Chitosan lactate is non-toxic to humans and other terrestrial animals and plants but because it can be attracted to fish gills it has the potential to negatively impact the aquatic community. Therefore, Cascade EcoSolutions contracted with Nautilus Environmental Washington Laboratory to study the aquatic safety of our chitosan lactate. Nautilus was tasked with determining the species most sensitive to chitosan lactate and then perform testing to determine its toxicity threshold (LC25). They tested rainbow trout, fathead minnow and *Daphnia pulex*. Here is what Nautilus has to say about our chitosan lactate:

“The chronic test with fathead minnows was the most sensitive test conducted in this evaluation. The highest concentration with no observed effect (NOEC) was 7.5 mg/l for survival and 15 mg/l for growth. The EC25 [toxic threshold] for fathead minnow survival and growth was 15.7 mg/l and 17.4 mg/l, respectively. For application of the product, the Washington State Department of Ecology requires a three-fold safety margin between the concentration of the product at discharge [intended discharge concentration], and the toxic threshold for the product (WDOE, 2003). Thus, the data supports application of [ChitoVan] chitosan lactate at a rate of 5.23 mg/l.”

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In plain English the Nautilus report says, given the current stringent standards, EPA and Washington State would allow the release of our chitosan lactate to natural waters at a concentration of 5.23 mg/l (considerably higher than typical dose rates). But, Cascade EcoSolutions has developed technologies that purify contaminated water while retaining the chitosan lactate with the removed

contaminates. How do we know this? We developed a colorimetric field test that can detect chitosan lactate in treated water at concentrations as low as 0.2 mg/l. This test is inexpensive, easy to use and reliable.

Table 1
Chitosan Lactate Toxicity Results

| Sample Type | Species | Test Type | EC50 mg/l | EC25 mg/l |
|--|-----------------------------|---------------|-----------------|----------------|
| ChitoVan Lactate | Fathead minnow ¹ | 7-day chronic | 23.4 (survival) | 17.4 (biomass) |
| ChitoVan Lactate | Rainbow trout | 7-day chronic | >30 (survival) | 24.2 (biomass) |
| ChitoVan Lactate | Daphnia pulex | Acute | 353 (survival) | 138 (survival) |
| 1 – Most sensitive species for ChitoVan lactate | | | | |
| Tests performed by: AMEC Earth and Environmental Laboratory, later purchased by Nautilus Environmental Washington Laboratory Results are given in mg/L of whole product | | | | |