

The effect of tungsten and vanadium complexes on the growth of coral symbiotic microalgae *Breviolum minutum* and *Effrenium voratum*

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Highlights

Symbiosis with *Symbiodiniaceae* microalgae is essential for coral growth. The biochemistry of Mo and V in these organisms is affected either by changing metal speciation (free vs complexed metals) or metal identity (Mo vs W).

Resumo/Abstract

Scleractinian corals, the main reef builders, depend on a symbiotic relationship with *Symbiodiniaceae* dinoflagellates for growth in oligotrophic waters. These symbionts provide photosynthetic nutrients to the corals, and in turn rely on many metal ions for thriving. Tungsten may replace molybdenum and improve the metabolism of some microalgae, while vanadium may improve their growth. Dithiolenes such as MNT are structural biomimetics of highly stable W and V complexes. In this work, the effects of [W(IV)(MNT)] and [W(VI)(MNT)] (both at 30 nM), and VCl₃ and [V(MNT)] (both at 11.7 μM) on the growth of the coral symbionts *Breviolum minutum* (BMAK213) and *Effrenium voratum* (BMAK212) were studied. The microalgae were seeded in F/2 culture medium and maintained at 20°C under 80 μE m⁻² s⁻¹ illumination with a 12:12 h photoperiod. 1.5 mL of inocula were transferred to 26.5mL of modified F/2 medium without added Mo (for treatments with W complexes) or Fe (for treatments with V compounds), and incubated as described. Cell densities were monitored on days 14, 21, and 32 using a hemocytometer, and growth rates were evaluated during the exponential growth phase. Both W complexes were able to sustain microalgae growth in the medium depleted of Mo. However, only VCl₃ was able to promote growth in the medium depleted of Fe, while [V(MNT)] caused significant toxicity at 11.7 μM. These results indicate that metal speciation induces striking differences to *Symbiodiniaceae* metabolism and confirms the potential of W as a substitute for Mo as an essential micronutrient for these microalgae.

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