TITLE: Effect of oxygen and light in the expression of riboflavin and iron provision genes in the pathogenic bacteria *Vibrio cholerae*.

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ABSTRACT

Vibrio cholerae is a pandemic pathogen causing cholera, a disease characterized by acute, life-threatening diarrhea. This bacterium obtains the essential vitamin riboflavin (vitamin B2) through the riboflavin biosynthetic pathway (RBP) comprised by the RibDEABH proteins or by uptake through the RibN importer. The RBP genes are encoded in a main operon containing *ribDEBH* and two monocistronic units encoding *ribA* and a second *ribB* ortholog. Although the co-occurrence of the RBP and riboflavin uptake systems is common in bacteria, is not clear how these two functions relate to provide riboflavin. We have previously reported that extracellular riboflavin downregulates *ribB* but it has no effect in transcription of the rest of the RBP genes or *ribN*. Also, we have documented that the riboflavin regulon highly overlaps with the iron regulon and that a reciprocal regulatory effect between the provision genes of these two molecules exists. This could be a reflex of the fact that riboflavin and iron are the most important redox cofactors, often involved in related physiological processes. In this study, we assessed the effect of environmental factors, namely oxygen and light, in the expression of RBP and *ribN* riboflavin importer genes by real time polymerase chain reaction. In attendance to the iron-riboflavin metabolic relationship, we also analyzed the expression of *tonB1*, coding for a protein required by multiple iron acquisition systems. Results showed that growing in hypoxia has a differential effect on the expression of riboflavin provision genes. While low oxygen promotes increases in transcription of *ribB* and *ribN*, it downregulates *ribA*. No effect of low oxygen was observed in the expression of *tonB1*. Strikingly, while light does not affects the expression of riboflavin provision genes, it highly increases the expression of *tonB1.* Results suggest that hypoxia may induce an increase in riboflavin uptake over riboflavin biosynthesis and that the presence of light promotes an increase in iron uptake activity in *V. cholerae*.