Marinobacter hydrocarbonoclasticus 617 under denitrifying conditions develops a complete denitrification pathway. In this pathway, the nitrate reduction represents both a source to incorporate nitrogen into biomolecules and a way for dissipating the excess of reducing equivalents generated by the metabolism. During the growth in micro-aerobic or anaerobic environments nitrate can also be exploited as respiratory substrate contributing to the generation of the proton motive force across biomembranes. The nitrate reductase responsible for this process (Nar) catalyzes the first step of denitrification pathway by a two-electron reduction of nitrate to nitrite.

Prokaryotic nitrate reductases belong to the DMSO reductase family of Mo-containing enzymes. The respiratory nitrate reductase NarGHI is a membrane-bound protein complex that catalyzes the starting reaction of the respiratory nitrate reduction pathway.

The aim of this work is to gain some insights into the catalytic mechanism of the respiratory nitrate reductase NarGH from Marinobacter hydrocarbonoclasticus 617, comparing the steady state kinetic and the electrochemical responses in presence of alternative substrates such as potassium chlorate (KClO₃) and potassium perchlorate (KClO₄). The enzyme inhibition, in presence of the competitive inhibitor potassium azide (KN₃), has also been studied both kinetically and electrochemically.