

Diffusible signal factor signaling controls bioleaching activity and niche protection in the acidophilic, mineral-oxidizing leptospirilli

- Bellenberg S.^a,
- Salas B.^b,
- Ganji S.^c,
- Jorquera-Roman C.^d,
- Valenzuela M.L.^e,
- Buetti-Dinh A.^{f,g},
- Unelius C.R.^c,
- Dopson M.^a,
- Vera M.^{b,d}

Abstract

Bioleaching of metal sulfide ores involves acidophilic microbes that catalyze the chemical dissolution of the metal sulfide bond that is enhanced by attached and planktonic cell mediated oxidation of iron(II)-ions and inorganic sulfur compounds. Leptospirillum spp. often predominate in sulfide mineral-containing environments, including bioheaps for copper recovery from chalcopyrite, as they are effective primary mineral colonizers and oxidize iron(II)-ions efficiently. In this study, we demonstrated a functional diffusible signal factor interspecies quorum sensing signaling mechanism in *Leptospirillum ferriphilum* and *Leptospirillum ferrooxidans* that produces (Z)-11-methyl-2-dodecenoic acid when grown with pyrite as energy source. In addition, pure diffusible signal factor and extracts from supernatants of pyrite grown *Leptospirillum* spp. inhibited biological iron oxidation in various species, and that pyrite grown *Leptospirillum* cells were less affected than iron grown cells to self inhibition. Finally, transcriptional analyses for the inhibition of iron-grown *L. ferriphilum* cells due to diffusible signal factor was compared with the response to exposure of cells to N-acyl-homoserine-lactone type quorum sensing signal compounds. The data suggested that *Leptospirillum* spp. diffusible signal factor production is a strategy for niche protection and defense against other microbes and it is proposed that this may be exploited to inhibit unwanted acidophile species. © 2021, The Author(s).