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RESEARCH ARTICLE

Minibioreactor-gas collector for determining bacteria-produced hydrogen sulfide

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Abbreviations: rpm: revolutions per minute.

A simple and economical minibioreactor-gas collector system for determination of hydrogen sulfide produced by a microorganism was designed. The detection of hydrogen sulfide was based on the reaction between the hydrogen sulfide in the gas stream from the culture, and a lead acetate solution 0.090 mol/L, contained in a tube gas collector; the conductimetric back titration of lead excess was made, and hydrogen sulfide was quantified indirectly, being the detection limit 0.5 µmol. The developed system was applied using *Tsukamurella paurometabola* DSM 20162 as a model, being the amount of hydrogen sulfide produced, 1.2 µmol in 24 hrs.

There is a great diversity of microorganisms that produce hydrogen sulfide (Aiking et al. 1982; Kim and Olson, 1989; Barton and Tomei, 1995; Cooney et al. 1996; Levine et al. 1998; Wang et al. 2000), from organic (*i.e.* sulfur-containing amino acids) and inorganic sources (*i.e.* sulfates). Although hydrogen sulfide is a toxic pollutant gas generally occurring in wastewater, it has been used to precipitate metals in wastewater treatment reactors and has been proposed for stabilization of metals in soils and for formation of metal sulfide "quantum" particles for microelectronics applications (Holmes et al. 1997).

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When a novel hydrogen sulfide producer bacterial strain is isolated, it is necessary the physiological and biochemical characterization of such strain, in order to optimize the hydrogen sulfide production for its further application (Fortin et al. 1994; Peyton et al. 1995; White and Gadd, 1996; White and Gadd, 1998; Smith, 2000). Although the experimental determination of this compound has been done through different methods, and the analytical methods for H_2S detection and quantification have ranged from spectrophotometric analysis (Cline, 1969; Acree et al. 1971; Siegel, 1965; Chu et al. 1997) to gas chromatography (GC), either with distinct features in terms of accuracy, precision and detection limit (Heida et al. 1995; Chinivasagam et al. 1998; Mestres et al. 1999); the study at small scale is a suitable and economical option for the achievement of a such objective.

In this paper a minibioreactor-gas collector system designed for characterization and study of hydrogen sulfide production from bacteria, is described. In addition, a simple analytical method, based on H_2S indirect conductimetric determination as a modification of the method of lead acetate for detection of hydrogen sulfide (Hunter and Crecelius, 1938), was developed. The gas stream from the minibioreactor passes through a lead acetate solution