

Cocaine degradation by *Pseudomonas stutzeri*: an alternative approach for the final disposal of a dangerous solid waste

C.A. Díaz¹, E. Restrepo², W. F. Garzón³ and J.C. Higueta¹

¹ Department of Chemical Engineering, Biology and molecular sciences laboratory, National University of Colombia, Manizales, Caldas, 170003, Colombia.

² Department of Physics and Chemistry, Plasma Physics Laboratory, National University of Colombia, Manizales, Caldas, 170003, Colombia.

³ Department of criminalistics, Chemistry Group, Fiscalía General de la Nación, Bogotá D.C, Colombia

Keywords: solid waste, Cocaine, Bacterial degradation, Adaptation.

Presenting author email: jchiguitav@unal.edu.co

ABSTRACT

Cocaine and tropane alkaloids are considered illegal drugs of abuse and represent a big social problem since thousands of tons are confiscated every year by the authorities. The final disposal of this alkaloid is usually incineration in open spaces then creating an environmental burden. Some strains of *Pseudomonas* can metabolize and degrade tropane alkaloids to obtain energy from these carbon and nitrogen sources (Kosieradzka *et al*, 2014). Several alkaloids degradation have been studied mainly in mammalian liver cells (Kloss *et al*, 1983). Nevertheless, there are no studies found showing degradation of cocaine by *Pseudomonas stutzeri*. In consequence, the aim of this research was to grow *P. stutzeri* in a formulated medium using confiscated cocaine hydrochloride as the only carbon source.

Studies on the growth of *P. stutzeri* show that this strain can adapt to a wide range of substrates (Kosieradzka *et al*, 2014). Figure 1. shows *P. stutzeri* growth at 50,100, 400, and 600 ppm of cocaine as the sole carbon source. Glucose (20g/L) was used as the comparing control (see Figure 2). The lower substrate concentrations showed less growth likely due to substrate limitations. Cocaine at 600 ppm showed the best growth in the first 24h of cultivation. Substrate consumptions vary from 10 to 50% depending on growth and substrate availability as measured by chromatographic analyses.

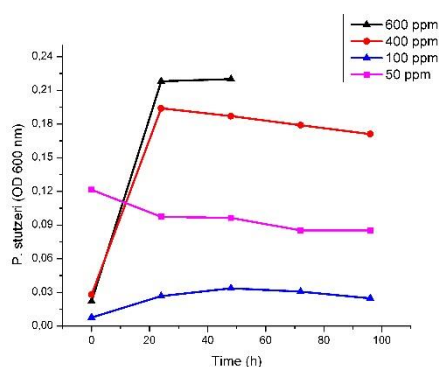


Figure 1. Growth of *P. stutzeri* at 50, 100, 400, and 600 ppm of cocaine.

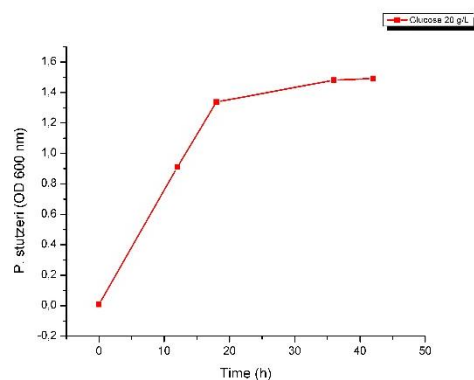


Figure 2. Growth control of *P. stutzeri* in glucose.

In conclusion, *P. stutzeri* was able to adapt and grow using cocaine as the only carbon source in a formulated medium. Although further studies must be conducted in order to improve growth of this bacterial strain to the substrate, the capability of *P. stutzeri* to degrade cocaine serves as potential for the implementation of a novel and alternative strategy for the final disposal and destruction of this dangerous and contaminating waste.

References

Kosieradzka, K., Le Faouder, P., Molinié, R., Gentil, E., Lebreton, J., Robins, R., (2014). Tropane alkaloid metabolism by *Pseudomonas* AT3 cell cultures: Interchange between the nortropine and norpseudotropine catabolic pathways. *Phytochemistry Letters* 10, 60-68.

Kloss, M., Rosen, G., Rauckman, E., (1983). N-demethylation of cocaine to norcocaine. *Mol. Pharmacol.* 23, 482–485.