UNIVERSIDAD NACIONAL DE COLOMBIA

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

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Overview

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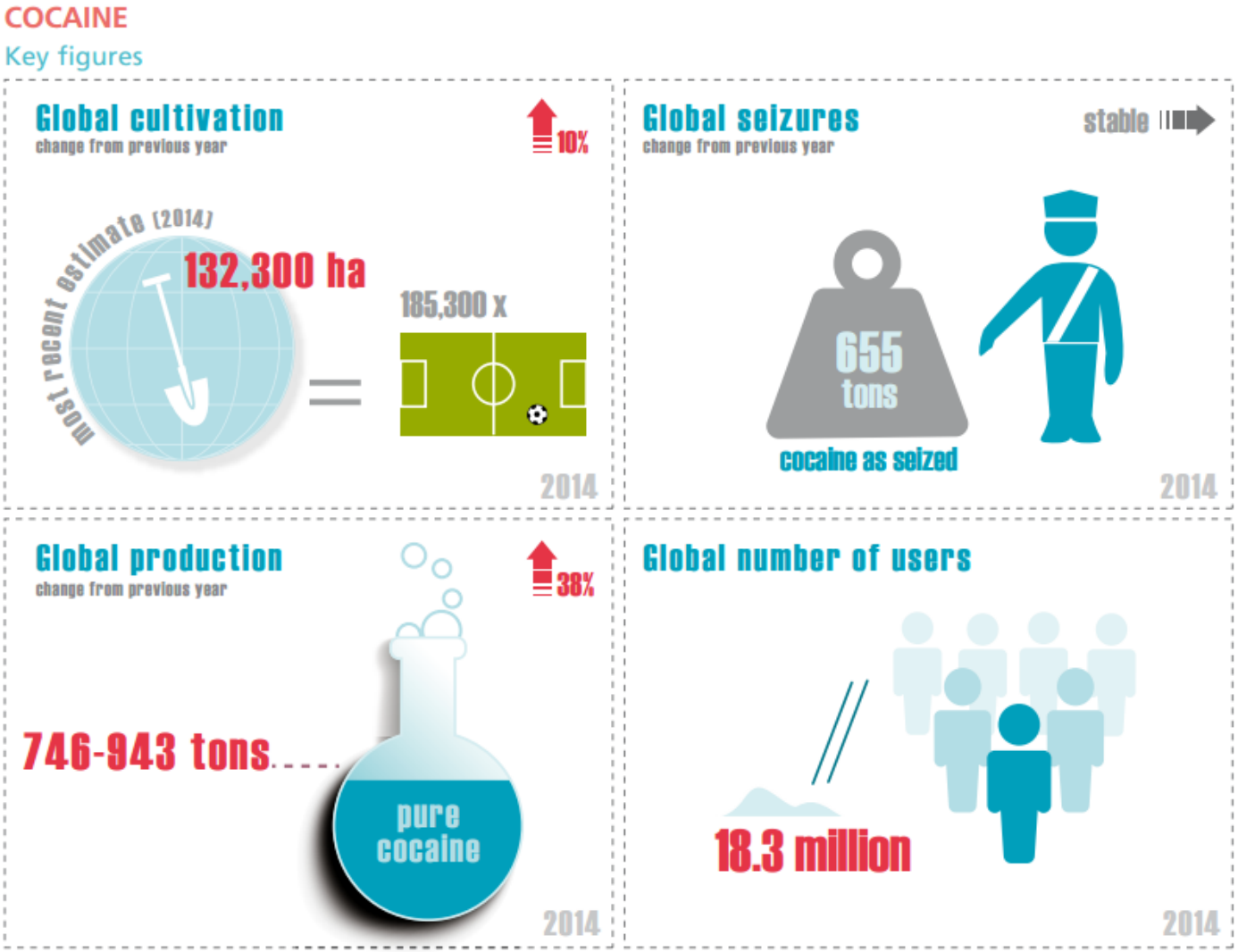
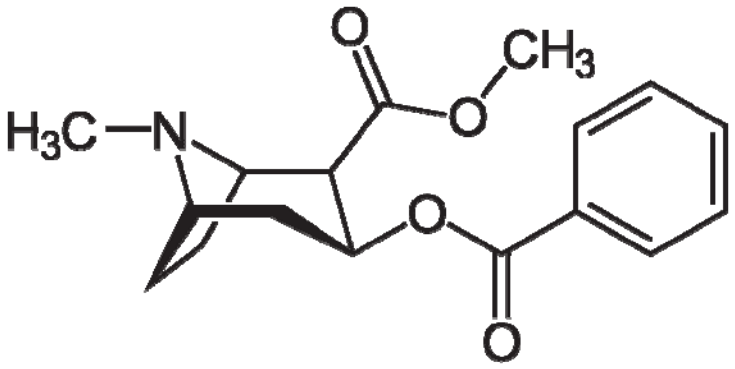
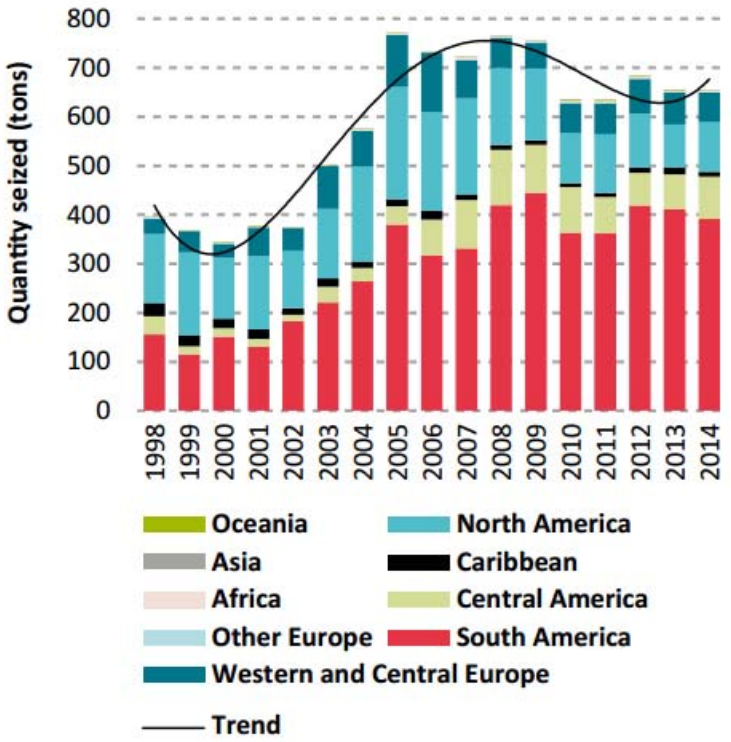
Introduction





Introduction

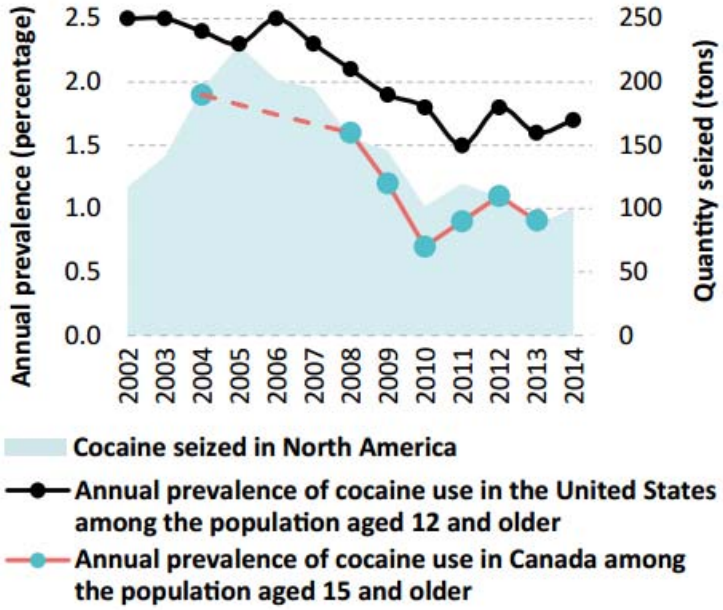
Quantities of cocaine seized, by region, 1998-2014



Source: Responses to the annual report questionnaire.

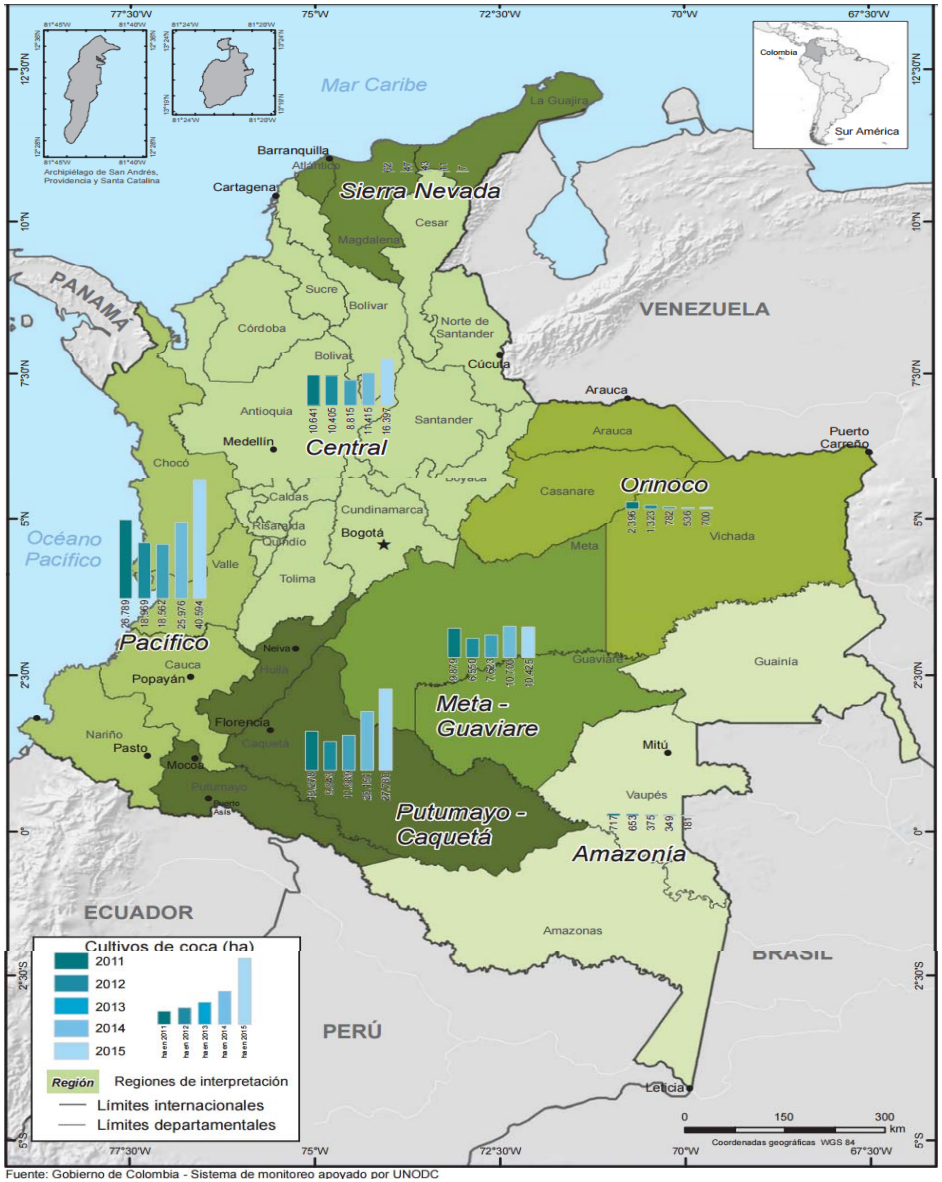
Note: The seized forms of cocaine included cocaine hydrochloride, coca paste and base and "crack" cocaine, and the quantities seized were not adjusted for purity.

Quantities of cocaine seized in North America and prevalence of past-year cocaine use in Canada and the United States, 2002-2014



Source: Responses to the annual report questionnaire, the United States National Household Survey on Drug Use and Health and the Canadian Tobacco, Alcohol and Drugs Survey (CTADS) 2013.

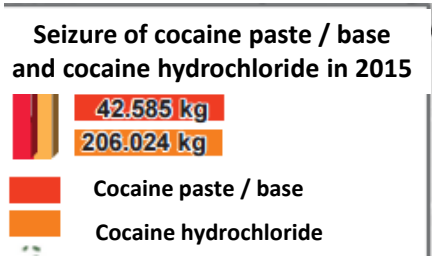
Note: Data for 2002 have been used as baseline data, as the United States National Household Survey changed its methodology several times between 1998 and 2002.



Fuente: Gobierno de Colombia - Sistema de monitoreo apoyado por UNODC

United Nations Office On Drugs And Crime. (2016). Monitoring affected ladn by illicit crops 2105: United Nations publication.

Seizure figures in Colombia in a decade reached 2,000 tons

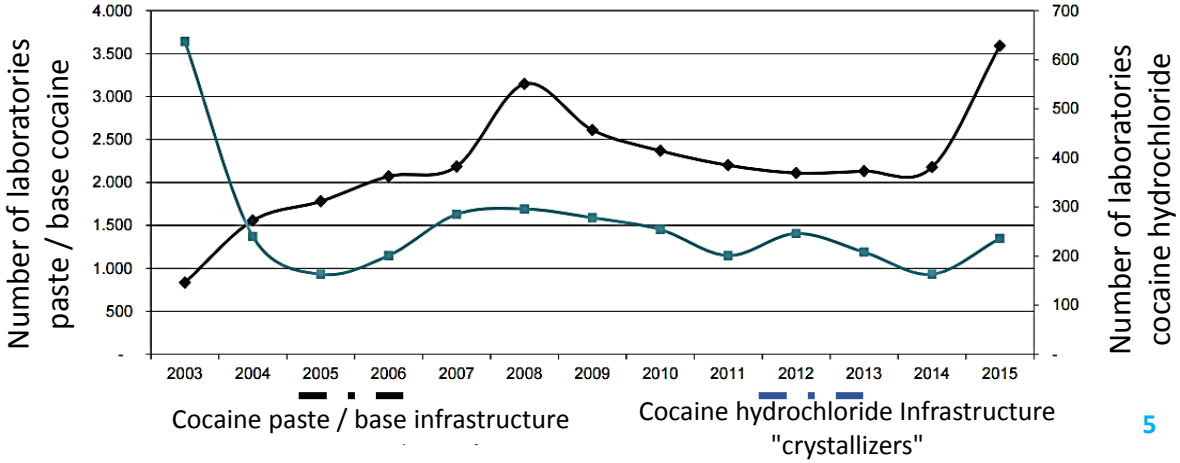


In 2016, Colombia seized 308 metric tons, 59 more than in all 2015

The Narcotics Division of the National Police of Colombia has already seized 130 tons in 2017

6,8 kg per hectare where four harvests are exceeded per year.

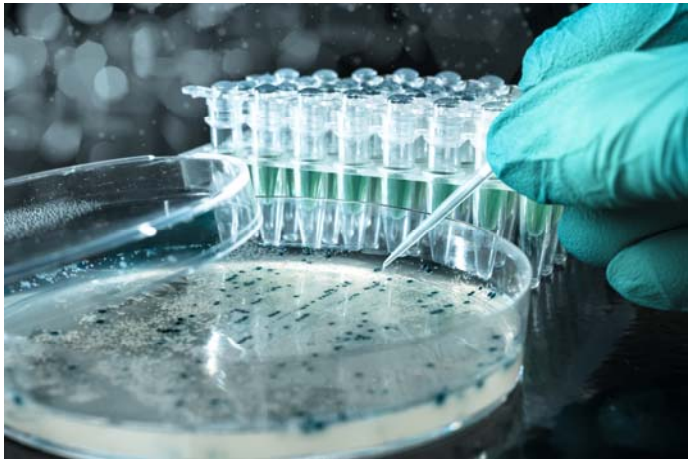
Production and refinement of cocaine



Objective

The aim of this research was to grow and adapt *Pseudomonas stutzeri* in a minimum medium using cocaine hydrochloride as the only carbon source as an alternative disposal method to reduce the contamination of this drug of abuse.

Vs



General Method

Cryopreserved strains

Incubator 32°C, 150 rpm

Inoculate each strain separately in salt medium

Spectrophotometry analysis

Bacterial growth kinetics and quantification by HPLC-MS

Reactivation of strains and adaptation to test substrate

Methods

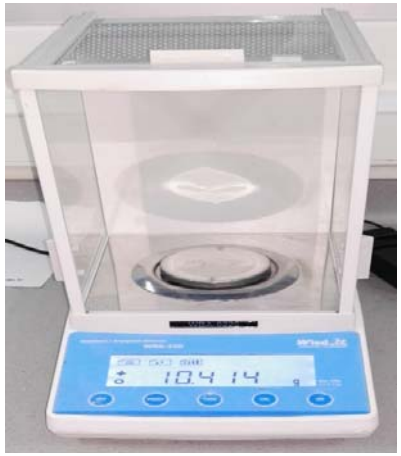

Wisd


6000
10:00


Wisd


SANYO
VIP PLUS
VIP SERIES


Wisd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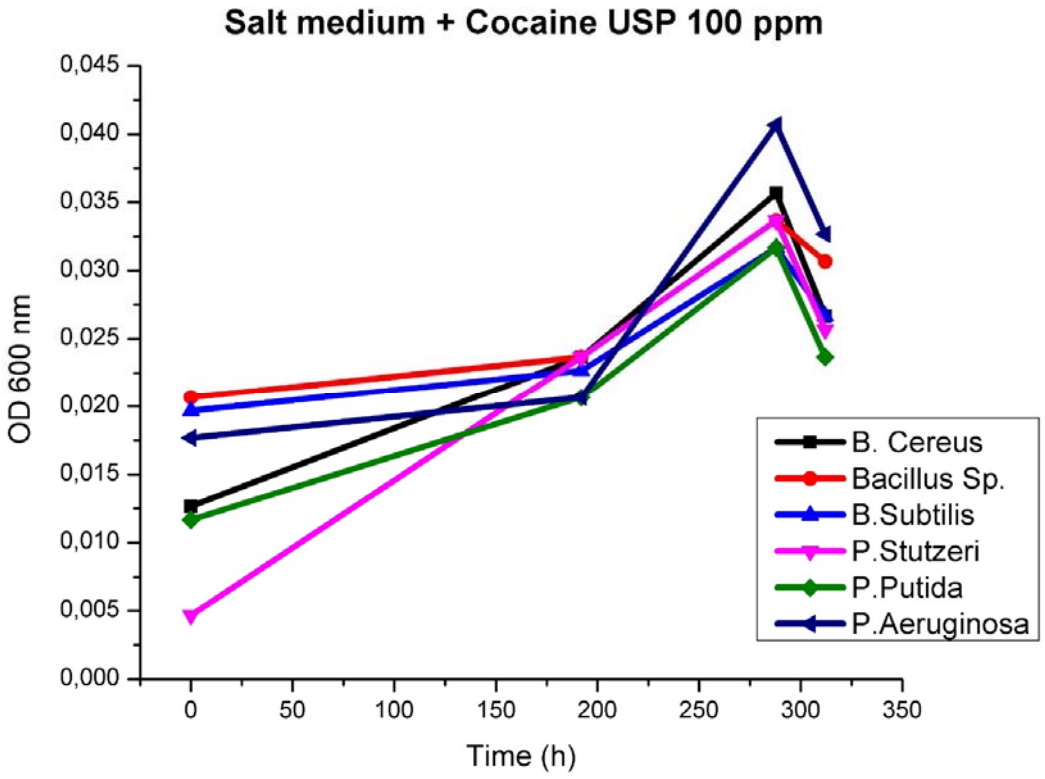
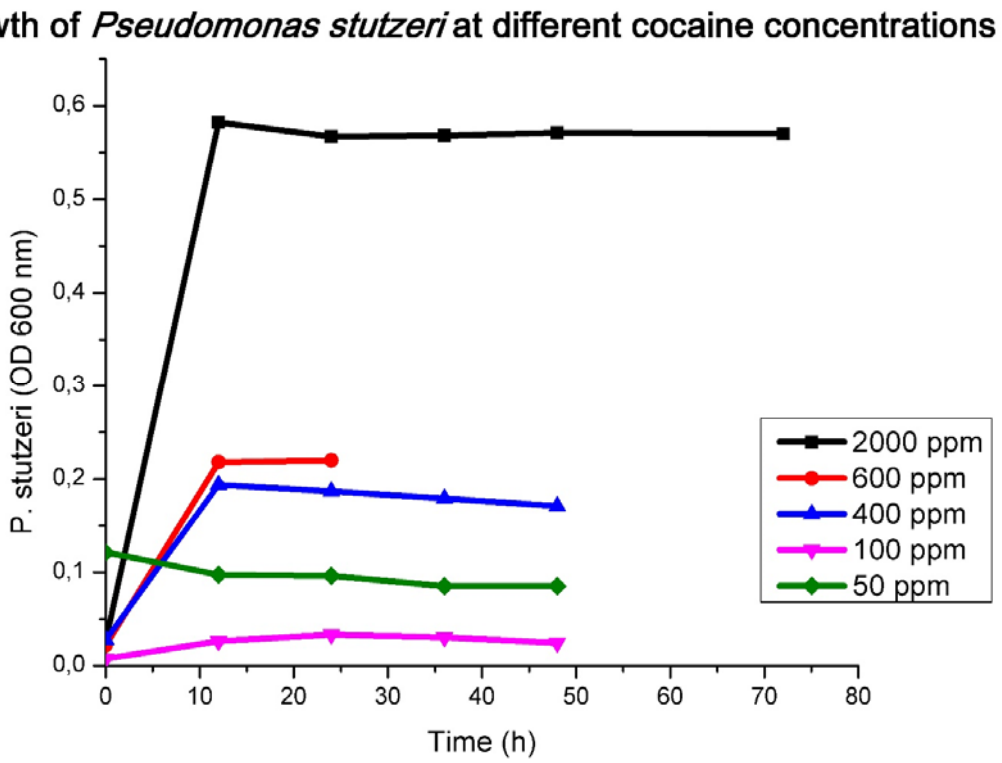
Thermo

Methods

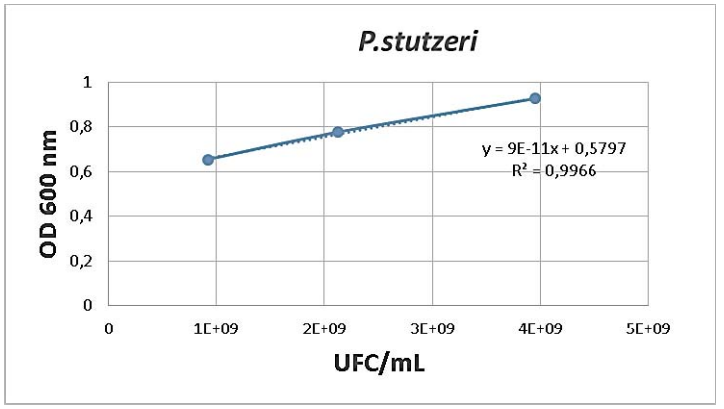
Cromatographic conditions	
Parameters	**Value**
Mobile Phase	Mixture of the dibasic sodium phosphate solution 0.05mol L-1 pH 8.0 and acetonitrile (70:30 v/v).
Mode	Gradient
Detector	UV 235nm
Column Flow	1,0 mL/min
Rt Cocaine	1,802 min
Work temperature	RT

Results

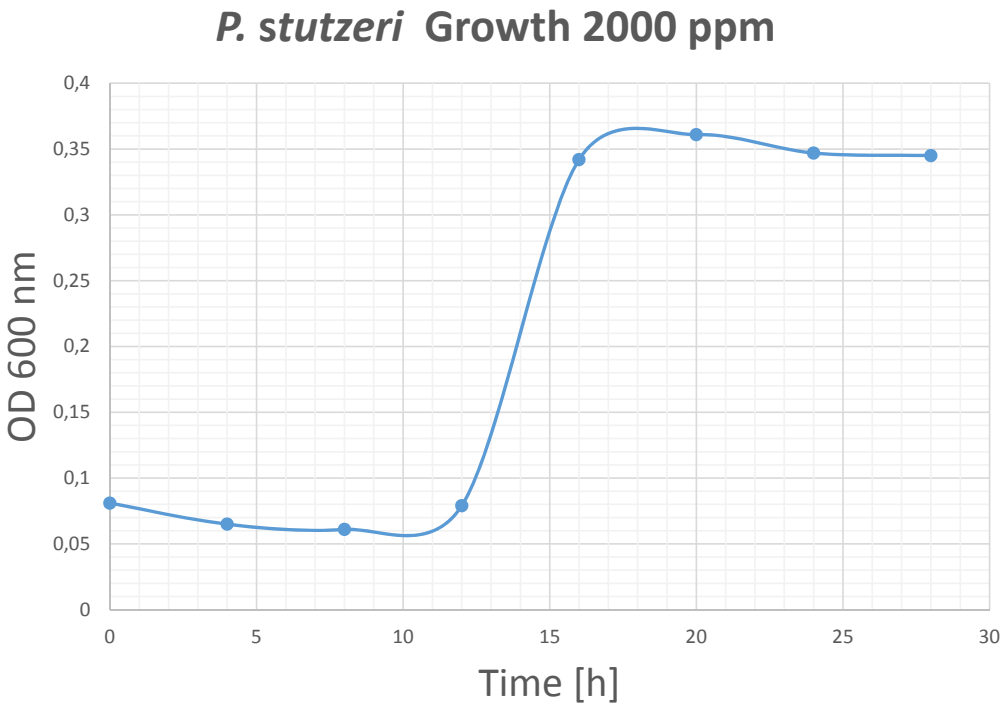


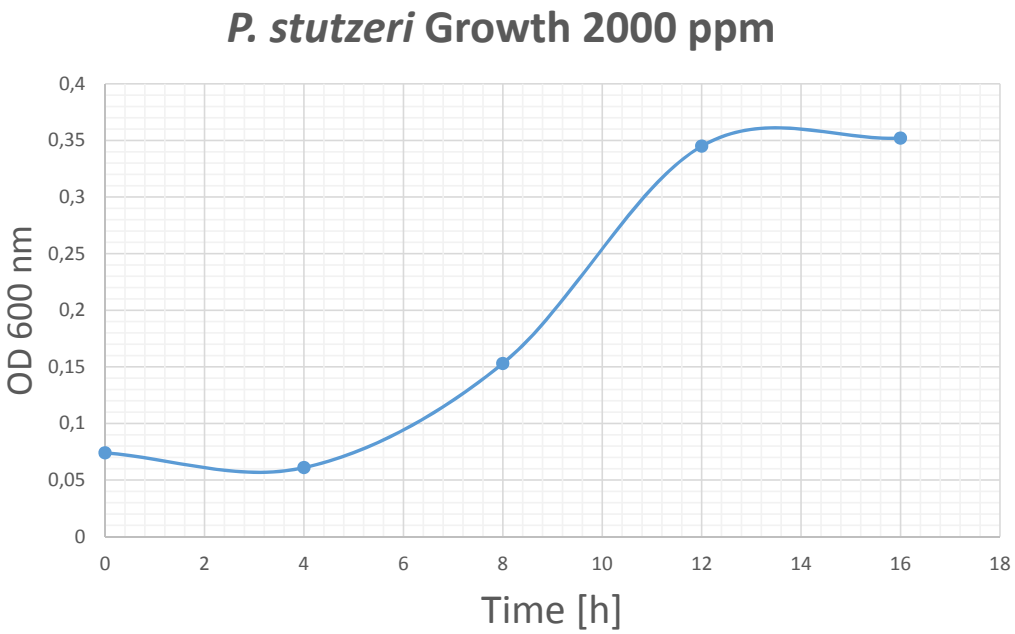


Several strains were evaluated and the one that showed the best adaptation was *P. stutzeri.*



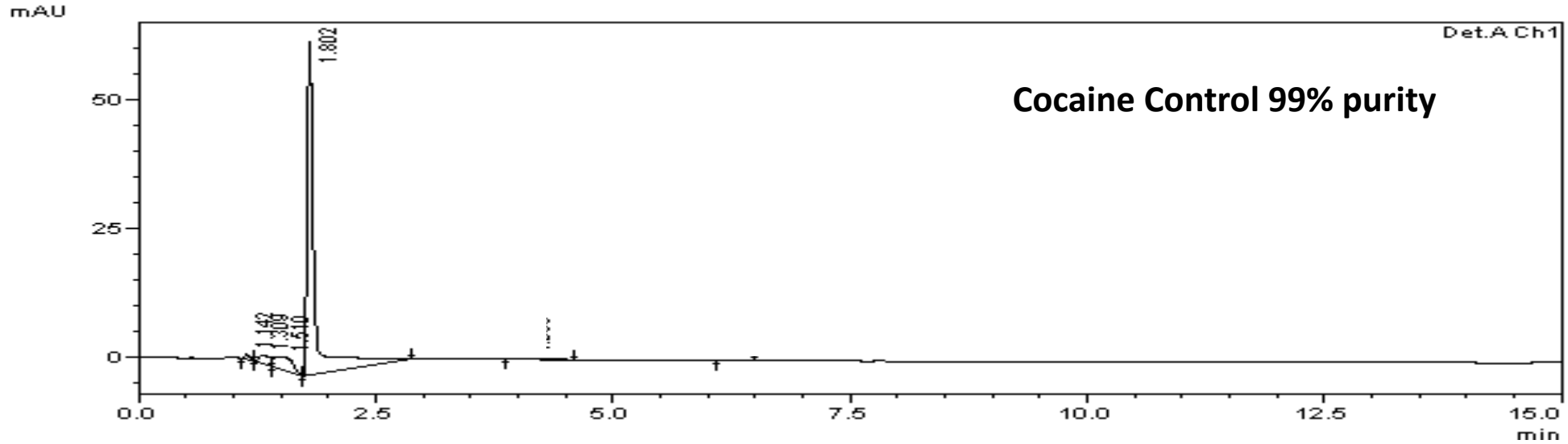
Growth kinetics

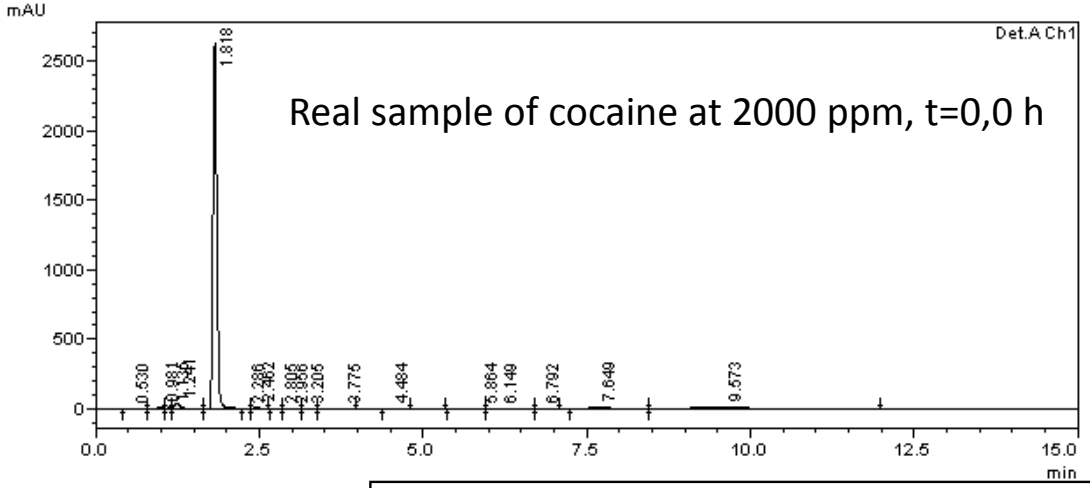


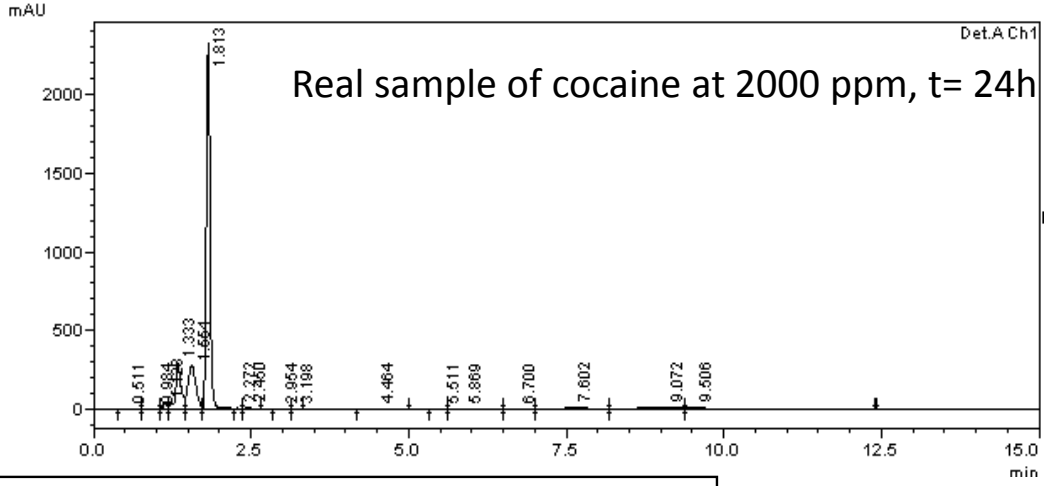


The first growth was between 12 to 16 h, while succesive growths reduced the time growth between 4 to 12 h.

Chromatographic results of cocaine consumption by *Pseudomonas stutzeri*







There was a 50% removal in the cocaine concentration in 24h

Conclusions

- There was a good adaptation of *P. stutzeri* to the cocaine substrate as the only carbon source in a saline medium.
- The major adaptation was at 2000 ppm.
- The removal of cocaine, so far, was 50%.
- The adaptation process of *P. stutzeri* to use cocaine as carbon source, might help as an alternative destruction method of this substance.
- Further studies must be conducted in order to adapt microorganisms to higher concentrations of cocaine and also to obtain better removal values.

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Research Group of the International Center for Strategic Studies Against Drug Trafficking - Colombia