

Motility Assessment of the Ciliated *Tetrahymena pyriformis* after Exposition to Toxic Compounds using Image Analysis

A. Luís Amaral, Ana Nicolau, Eugénio C. Ferreira*, Nelson Lima, Manuel Mota

Centro de Engenharia Biológica – IBQF, Universidade do Minho, 4700 Braga, Portugal

Keywords: Protozoa; *Tetrahymena pyriformis*; motility; image analysis.

Ciliated protozoa play an essential role in the purification of wastewaters by removing, through predation, the major part of the dispersed bacteria, in the aeration tank. A complex food web exists and a change in the protozoan community will affect this whole ecosystem and, therefore, the biological performance of the plant. Being very sensitive to environmental changes, protozoa are an important tool as biological indicators of water quality[1].

Image analysis is commonly used nowadays in a wide range of applications within the biological sciences. It allows the enhancement of pictures as well as automatic identification and isolation of particles so that they can be properly studied. It also provides an extremely fast means of getting morphologic information, thus saving tremendous effort and time.

Few studies exist on the subject of motility measured by image analysis [2,3], since only recently processing and analysing images by computer in reasonable time is possible.

The aim of the present work is to study the relation between toxicity and the motility of *Tetrahymena pyriformis* in aquatic environment. This is a parameter connected with its viability, because energy is needed for cilia movements and, therefore, to *T. pyriformis* motility.

Four toxics were used: copper, zinc, the antibiotic ciclohexamide (which inhibits protein synthesis) and the neutral surfactant Triton X-100 (which directly disrupts cell membrane).

Main problems lie on the frequent non-linear movements of *T. pyriformis* and on the impossibility of calculating the vertical component of its movement, since one single plan can be digitalized to the computer. These aspects had to be accounted for in the recollection of the images to be processed. Brownian movements of dead cells are important in the discussion of results.

- [1] Nicolau, A., Lima, N., Mota, M. & Madoni, P. (1997) Os protozoários como indicadores da qualidade biológica das lamas activadas. *Boletim de Biotecnologia*, 56, 14-19.
- [2] Tsuchido, T., Yazunaga, K., Kawahara, H. & Obata, H. (1996) Evaluation of bacterial injury by image analysis of cell motion. *J. Ferm. Bioengineer.*, 78, 185-187.
- [3] Häder, D. P., Rosum, A., Schäfer, J., Hemmersbach, R. (1996) Graviperception on the flagellate *Englena gracilis* during a shuttle space flight. *J. Biotech.*, 47, 261-269.

Acknowledgement

Ana Nicolau was supported by grant BD/5080/95 from PRAXIS XXI. This project was partially supported by PRAXIS XXI- 2/2.1/ BIO/ 1118/ 95 contract.