TOXIC EFFECTS OF ERYTHROMYCIN TO FRESHWATER AND MARINE MICROALGAE

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Erythromycin (ERT) is a macrolide antibiotic frequently used in human and animal health care to combat bacterial infections and in aquaculture and livestock as growth promoter. A high part of the administered ERT is not adsorbed being eliminated to wastewater treatment plants where is not effectively removed/degraded [1]. Therefore, ERT has been found in aquatic systems (at ng L^{-1} to µg L^{-1}) [2]. However, the knowledge of ERT impact to non-target organisms is limited. Microalgae, as primary producers, are one of the first organisms to be in contact with aquatics contaminants. Thus, it is of emerging concern to study the impact of ERT in freshwater and marine microalgae. In this study, it was evaluated the impact of ERT on the growth of the freshwater alga *Pseudokirchneriella subcapitata* (during 72 h) and of the marine *Dunaliella tertiolecta* (during 96 h). EC_{10} of 5 and 1880 µg L^{-1} and EC_{50} of 38 and 5745 µg L^{-1} were obtained for *P. subcapitata* and *D. tertiolecta*, respectively. So, the freshwater alga *P. subcapitata* presented a higher sensitivity (ppb level) to ERT than marine one (ppm level). In addition, the EC_{10} value presented by *P. subcapitata* is within the range of concentrations detected in surface and ground waters [3]. Due to its environmental relevance and sensitivity to ERT, further studies were performed in order to contribute for the elucidation of the mechanisms of action of this macrolide on the alga *P. subcapitata*. For this purpose, algal cells were exposed to ERT during 72 h to four concentrations of ERT, corresponding to: no observed effect concentration (NOEC), EC_{10}, EC_{50}, and EC_{90} values. ERT did not affect cell viability of *P. subcapitata* but promoted a cell volume increase for all concentrations tested. An increment on chlorophyll *a* (Chl *a*) fluorescence and content was observed for EC_{10} and EC_{50} values. The exposure of algal cells to an ERT concentration corresponding to EC_{90} enhanced the Chl *a* fluorescence but decreased the Chl *a* content. These results indicate that alga photosynthetic apparatus was seriously affected by ERT. A perturbation in the esterase activity was found even when the alga was exposed to an ERT concentration that did not modify the growth (NOEC). Alterations in the redox status of *P. subcapitata* were also detected. Thus, an increase of intracellular accumulation of reactive oxygen species for NOEC and EC_{10} values and an increase of reduced glutathione (GSH) content for EC_{50} and EC_{90} values was observed. In conclusion, ERT induces a negative effect on the physiologic and metabolic state of the alga *P. subcapitata*, a non-target organism.

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