

## Final project report

<i>Project ID</i>	2004/1.09
<i>Title</i>	POLARTOX - Caratterizzazione di neurotossine da neogasteropodi di ambiente polare
<i>Principal investigator</i>	STEFANO RUFINI
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<i>Duration</i>	3 years
<i>Assigned funding</i>	40.000,00 Euro

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## Activities and results

Aim of our project was to purify and characterize biologically active molecules derived from organisms living in extreme ecological conditions such as those found in the Antarctic continent. In particular, we focused our research toward proteins produced by venomous organisms belonging to the Mollusca and Cnidaria Phyla. The venoms from these organisms represent one of the major sources of natural molecules, reported as useful tools for biological investigation as well as for potential therapeutic use. The hypothesis underlying this project is that organisms living in extreme conditions produce toxins which are basically different from those produced by organisms living in more temperate environments that have been purified so far. Different ecological and physical conditions could play an important pressure role on these organisms for the molecular selection of new defensive and offensive weapons. It is noteworthy that a precise correspondence exists between single Mollusca species and the toxin produced, thus a correct taxonomic identification of the species is mandatory for a serious study of this class of natural products. However, the univocal Linnean classification of a species still represents an open problem for the taxonomy: for this reason, we developed novel strategies to avoid misidentifications of Mollusca specimens based on morphological and molecular analysis of specific regions of mitochondrial DNA. In this context we applied the analysis of the internal transcript spacer 2 (ITS2) of ribosomal RNA, one of the more variable DNA regions, as a marker for molecular identification of different species of Mollusca. Moreover, in order to obtain information about the diet of some Gastropoda, we succeeded in developing a method based on the analysis of ITS2 in both Mollusca muscle and stomach content. The amplification of the DNA contained in the stomach of the mollusc allows to define the biological nature of the diet giving important information on the ecology of the species. We utilized our original method to study the alimentary habits of a Neogastropoda family, the Coralliophilinae that feeds specifically on Antozoa. A second part of the research was devoted to the study of StnII, the toxic component of the venom of the Cnidaria *Stichodactyla helianthus* that shows specificity towards sphingolipids. Being several pathological dyslipidoses, such as Niemann-Pick C (NPC) and Gaucher Diseases, characterized by the accumulation of this class of lipids into the cell, we developed a method for the rapid diagnosis of these pathologies by using the unique properties of StnII. For this purpose we used a system made by StnII and its specific antibody labeled with the fluorescent rhodamine. Initial results demonstrated the ability of this system to easily differentiate cells obtained by NP patients with respect to cells from control individuals.

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## Products

### A – papers in scientific magazines

1. Mariottini P., Di Giulio A., Smriglio C. & Oliverio M., 2008. Notes on the *Bela brachystoma* complex, with description of a new species (Mollusca, Gastropoda: Conidae). *Aldrovandia* 4: 3-20
2. Oliverio M., Modica M. V., 2009. Relationships of the haematophagous marine snail *Colubraria* (Rachiglossa: Colubrariidae), within the neogastropod phylogenetic framework. *Zoological Journal of the Linnean Society*, 2010, 158, 779–800.
3. Oliverio M., Barco A., Modica M. V., Richter A., Mariottini P., 2009. Ecological barcoding of corallivory by second internal transcribed spacer sequences: hosts of coralliophilinae gastropods detected by the cnidarian DNA in their stomach. *Molecular Ecology Resources*, 9: 94-103

### B – book chapters

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## Programma Nazionale di Ricerche in Antartide (PNRA)

### C - proceedings of international conferences

1. C. Frank, D. Grossi, G. De Chiara, M.C. De Stefano, G. Biagini, V. Tancredi, S. Rufini, D. Merlo, G. D'Arcangelo. (2010) A novel pharmacological approach and identification of peripheral cellular biomarkers in Niemann-Pick type C disease patients. International Congress RARE DISEASES AND ORPHAN DRUGS. Rome, February 22nd - 25th.
2. Claudio Frank, Daniele Grossi, Giovanna De Chiara, Mauro Racaniello, Giuseppe Biagini, Virginia Tancredi, Stefano Rufini, Daniela Merlo, Giovanna D'Arcangelo: "Neurological impairment in Niemann-Pick C Disease: a study on the role of excitatory neurotransmitter receptors and identification of peripheral cellular biomarkers". (2009) Workshop "ISS-NIH collaborative Programme on Rare Diseases: final reports of the projects"; November 23 -27; Rome – Italy.
3. Kosyan, A. R., Modica, M. V. and Oliverio, M. (2007) The anatomy and relationships of Troschelia (Neogastropoda: Buccinidae): New evidence of a closer fasciariid-buccinid relationship? "Neogastropod Origins, Phylogeny, Evolutionary Pathways and Mechanisms" World Congress of Malacology, Antwerp, Belgium, 15-20 July 2007.
4. Taviani, M., Angeletti, L., Dimech, M., Mifsud, C., Freiwald, M., Harasewych, M.G. and Oliverio, M. (2007) Coralliophilinae (Gastropoda: Muricidae) associated with deep-water coral banks in the Mediterranean.
5. "Neogastropod Origins, Phylogeny, Evolutionary Pathways and Mechanisms" World Congress of Malacology, Antwerp, Belgium, 15-20 July 2007.
6. Oliverio, M., Barco, A. Richter, A. and Modica. M.V. (2007) The coralliophiline (Gastropoda: Muricidae) radiation: Repeated colonizations of the deep sea? "Neogastropod Origins, Phylogeny, Evolutionary Pathways and Mechanisms" World Congress of Malacology, Antwerp, Belgium, 15-20 July 2007.
7. Romeo C., Benedetti I., Di Francesco L., Oliverio M., Ponticelli F. & Schininà M.E. (2007) Conus ventricosus venom peptides profiling: insights into intraspecific variation. 5th European Conference on Marine Natural Products (Ischia, 16-21 Sept. 2007).

### D – proceedings of national meetings and conferences

1. Oliverio M., Barco A., Modica M. V., Richter A., Mariottini P., (2008) The ecological DNA-Barcoding of corallivory in the deep-sea . "Il DNA Barcode: progetto chiave per lo studio e le applicazioni della Biodiversità Molecolare". Roma (CNR), 22 23 Luglio 2008

### E – thematic maps

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### F – patents, prototypes and data bases

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### G – exhibits, organization of conferences, editing and similar

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### H - formation (PhD thesis, research fellowships, etc.)

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## Research units

Stefano Rufini – Dipartimento di Biologia, Università di Roma "Tor Vergata"

Paolo Mariottini - Dipartimento di Biologia Università Roma 3

Marco Oliverio - Dipartimento di Biologia Animale e dell'Uomo Università di Roma "La Sapienza"

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