Programma Nazionale di Ricerche in Antartide (PNRA)

Final project report

Project ID:	2003/1.01
Title:	*Molecular analysis of dystroglycan in Antarctic fish*
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Duration:	2 years (2003-2004)
Assigned funding:	€ 15.000

Activities and results

During the last years, the dystroglycan (DG) complex has taken center stage in biomedicine (1). The complex is composed of two subunits, alpha (a highly O-glycosylated peripheral protein) and beta (transmembrane), and in mammals and lower vertebrates, including D.rerio (zebrafish), it represents a consolidated sarcolemmal marker.
During the two years of work, a series of freshly frozen fish muscle samples have been collected and used both for the analysis of protein extracts (via Western blot) and for the RT-PCR-based amplification, and subsequent cloning, of portions of the DG gene in control and Antarctic fish species. This research project has allowed to collect some preliminary but very important results on the structure and function of the DG complex in fish and Antarctic fish. For the first time, the presence of the DG complex was demonstrated also in antarctic fish, both in the cold-adapted Chionodraco hamatus (icefish) and the red-blooded Trematomus bernacchii (2). Moreover, the analysis of the gene structure and of its evolutive pathway demonstrated i) gene duplication events of DG in some other control species (including pufferfish) ii) and the presence of a novel mini-intron (of about 120 bp) (2).
These first results should be considered important also for the possible positive implications in human biomedicine. In fact, the full knowledge at the molecular level of the structure-function relationships of the DG complex may be important to develop new diagnostic or therapeutic protocols for the treatment of severe muscular dystrophies, including congenital or late onset "secondary dystroglycanopathies" (3).
In this context, it would be very important during the next years to continue and extend the comparative study of the DG complex in fish and antarctic fish.
Furthermore, the interface between the two DG subunits is likely to represent an ideal "hot-spot" for testing novel compounds and/or drugs that could act reinforcing the stability of a diseased sarcolemma such as the one observed in neuromuscular patients (4).

References

1) The dystroglycan complex: from biology to cancer. Sgambato, A. and Brancaccio, A. (2005) *J. Cell. Physiol. 205*, 163-169.
2) Duplication of the dystroglycan gene in most branches of teleost fish. Pavoni, E., Cacchiarelli, D., Tittarelli, R., Orsini, M., Galtieri, A., Giardina, B. & Brancaccio, A. *BMC Molecular Biology* 8:34 (2007).
3) Alpha-Dystroglycan, the usual suspect? Brancaccio, A. (2005) *Neuromuscul. Disord. 15*, 825-828.
4) Concerted mutation of Phe residues belonging to the beta-dystroglycan ectodomain strongly inhibits the interaction with alpha-dystroglycan *in vitro*. Bozzi, M., Sciandra, F., Ferri, L., Torreri, P., Pavoni, E., Petrucci, T.C., Giardina, B. and Brancaccio, A. (2006) *FEBS J. 273*, 4929-4943.

Products

A – papers in scientific magazines

1. Duplication of the dystroglycan gene in most branches of teleost fish. Pavoni, E., Cacchiarelli, D., Tittarelli, R., Orsini, M., Galtieri, A., Giardina, B. and Brancaccio, A. (2007) *BMC Mol. Biol.* 8, 34.

B – book chapters

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C - proceedings of international conferences

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D – proceedings of national meetings and conferences

1. Analysis of dystroglycan in Teleost fishes. Pavoni, E., Cacchiarelli, D., Tittarelli, R., Orsini, M., Morlacchi, S., Giardina, B. and Brancaccio, A. Società Italiana di Biochimica: Proteine 2006, Novara (Italy) June (2006).

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

Date:

Notes