



## Biomarkers for Abnormal Calcification-related Pathologies from Fish to Humans

We determined the regions of the MGP protein [matrix gammacarboxylated glutamic acid (Gla) protein] from sea bream (*Sparus aurata*) which are important for its physiological function as an inhibitor of mineralization. This was done using MGP point-and-deletion mutants which were transfected into a homologous cell system capable of mineralization that has recently been developed and characterized.

We also isolated a new Gla-containing protein that binds calcium mineral and which we called gammacarboxyglutamate-rich protein (GRP). This discovery has opened a new means of research into proteins related to ectopic calcification and their molecular mechanisms of action.

### Our Findings

The sea bream (*Sparus aurata*) Matrix Gla protein (SaMGP) point mutants (MGPMut) were constructed such that specific serines within the phosphorylation motif of SaMGP cDNA were replaced by alanines. Respective mutant clones for the production of *Sparus aurata* MGP were developed (point mutants and normal MGP). We have isolated and identified a new vitamin K-dependent protein, GRP, from sturgeon (*Acipenser naccarii*) cartilage. Using an *in silico* approach, coupled with a cloning strategy, we identified orthologs of the GRP gene in all vertebrate groups, including humans.

We used this information to develop a kit (patent no. WO/2010/024704) for the detection and quantification of GRP in tissue and fluid samples, as well as for the purification methods. We demonstrated that this protein has the ability to show *in vivo* a high capacity to bind calcium through specific Gla residues.

### Knowledge Output

- Mutant clones for the production of *Sparus aurata* MGP
- Isolation of GRP from sturgeon (*Acipenser naccarii*) cartilage
- cDNA, RNA and protein structures of GRP from different species from fish to human
- Distribution of GRP in several sturgeon tissues

### Potential Fields of Application

- Aquaculture, Fisheries, Health Biotech – regulation of extracellular matrix mineralization
  - Aquaculture, Fisheries, Health Biotech – Biomarkers for abnormal calcification-related pathologies in vertebrates
  - Health Biotech, Diagnostics and Pharma – Kit\* for GRP detection, purification and quantification
- \*Protected by patent and licensed to GenoGla Diagnostics – [www.genogla.com](http://www.genogla.com)

### Principal Investigator of this Portuguese Project

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**Title:** Marine Genomics for Users

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**Partners:** 7 partners from 6 countries

**Abstract:** Marine genomics knowledge is a vital part of 'blue biotechnology'.  
MG4U will facilitate knowledge and technology transfer of  
high-throughput marine genomics results to industry and society.

## Knowledge Transfer to Industry

To ease the uptake of research results on marine genomics we have developed several tools and offers for business:

- A database on knowledge outputs of several hundred national and international research projects as a first step for a quick overview on what is available and whom to contact for more detailed information. This includes references to publications, patents, accession numbers, as well as indications for areas of application. (The example overleaf is taken from this database.)
- Face-to-face contacts between academia and industry, facilitated through partnering and dedicated sessions at industry conventions.
- Workshops to exchange information, train in the use and application of genomic and bioinformatics methods, and for networking.

For each partner country a member of MG4U can help you to establish a direct contact to a scientist of your choice. Just go to [www.mg4u.eu](http://www.mg4u.eu) for dates, contacts and access to the knowledge output database.

## Partners for Collaboration

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## Project Partners



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