PhD proposal: Structure and functional role of a new iron-sulfur protein family in giant viruses

Laboratory of Bioenergetics and Protein Engineering (BIP), CNRS-AMU, UMR 7281, Marseille, France; Team: Biophysics of Metalloproteins.
Supervisors: Prof. Bruno GUIGLIARELLI, guigliar@imm.cnrs.fr, +33 632 440 265
Dr Bénédicte BURLAT, burlat@imm.cnrs.fr, +33 679 693 224

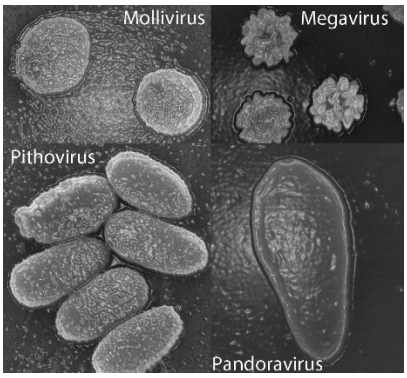
We are seeking for a highly motivated candidate for a PhD thesis on characterization of new iron-sulfur proteins in giant viruses. The PhD candidate will develop several chemical, biochemical and biophysical approaches including iron-sulfur reconstitutions, elementary analyses, spectroscopic methods (including CD, EPR, MCD) to characterize new iron-sulfur proteins recently discovered in giant viruses, their structure and function (see description of the proposal below).

The candidate should have a M.Sc. degree (or equivalent) in Chemistry, Physical-Chemistry or Physics. Background in Biology is not mandatory but the candidate should have a strong interest for interface between Chemistry and Biology.

The Laboratory is located in downtown Marseille in a large CNRS (French Research National Center) research campus gathering many technical facilities and scientific platforms. The Biophysics of Metalloproteins team has a long-standing expertise in metalloproteins including iron-sulfur proteins, using several biophysical approaches such as EPR spectroscopies.

Salary per month is around 1300 € net and duration of the PhD is 3 years. There is also teaching opportunity at the Aix-Marseille University depending on the CV of the candidate. Help in finding a suitable lodging will also be provided.

Interested candidates must contact Dr. Bénédicte Burlat (burlat@imm.cnrs.fr) and Pr B. Guigliarelli (guigliar@imm.cnrs.fr) as soon as possible (**deadline of the proposal 9th of May 2017**), joining their CV, a motivation letter, and the name of two reference persons.
Important: Selected candidates will be interviewed the 15th or 16th of May by the Doctoral School Committee in Marseille (or by visioconference).



Proposal summary: Giant viruses were discovered about more than a decade ago (1). They display unexpected features for viruses, namely the size of the viral particle higher than 0.5 µm and complex genomes containing from 500 to 2500 genes, depending on the virus. Most of their genes encode proteins never encountered before in a virus. Four families are identified to date, Mimiviridae, Pandoraviridae, Pithoviridae and Molliviridae (see SEM pictures above, ©IGS), and it is believed that these viruses are widespread and abundant in the environment (2).
Transcriptional analysis of Mimivirus infecting *Acanthamoeba* hosts revealed transcripts corresponding to unpredicted genes (3). Among them, the most transcripts (R633b gene) encode a small protein of 6kDa featuring a sequence mainly made of glycine and cysteine and which is among the most abundant proteins in the viruses. Our first characterization works suggest that this protein, named GG-FeS, houses an iron-sulfur (FeS) cluster which is different from those found so far in the cellular world (rubredoxin-like, [2Fe-2S], [3Fe-4S], [4Fe-4S]) (4).
Objectives of this work are to characterize the structure (nature of FeS center and 3D protein structure) of GG-FeS proteins family and to elucidate their function in the infectious process of Mimiviridae. Recombinant protein expressed in *E. coli* will be studied by combining *in vitro* FeS reconstitutions, elementary analyses and spectroscopic experiments (UV-Vis, EPR, CD, MCD, and Mössbauer). *In vitro* characterization of the recombinant protein will be done in parallel to *in cellulo* studies, i.e. EPR studies and iron determination of 1) *E. coli cells* overexpressing GG-FeS, 2) infected and non-infected amoeba, and 3) purified viruses. Research of the possible function of GG-FeS proteins family and their role during infection will lean on cellular localization studies and on

screening of interactions studies (protein/protein or protein/nucleic acid), activity assays for various substrates, redox properties, among others.
This research project will be done in close collaboration with the IGS laboratory (UMR 7256, Marseille, coll. Chantal Abergel) for structural biology, bioinformatics, cellular biology and with the CMB laboratory (UMR 5249, CEA Grenoble, coll. Geneviève Blondin) for Mössbauer spectroscopy.

Key-words: iron-sulfur protein, magnetic and magneto-optical spectroscopies, physico-chemical analysis, structural biology, biochemistry.

Références bibliographiques :

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