



**HAL**  
open science

## The diversity of the Mimiviruses glycosylation is governed by complex gene clusters

Anna Notaro, Olivier Poirot, Michela G Tonetti, Cristiana de Castro, Chantal Abergel

### ► To cite this version:

Anna Notaro, Olivier Poirot, Michela G Tonetti, Cristiana de Castro, Chantal Abergel. The diversity of the Mimiviruses glycosylation is governed by complex gene clusters. Society for Glycobiology virtual meeting 2020, Nov 2020, boston, United States. hal-03141210

**HAL Id: hal-03141210**

**<https://amu.hal.science/hal-03141210v1>**

Submitted on 15 Feb 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# The diversity of the Mimiviruses glycosylation is governed by complex gene clusters

Anna Notaro<sup>1,2</sup>, Olivier Poirot<sup>2</sup>, Michela G. Tonetti<sup>3</sup>, Cristina De Castro<sup>4</sup>, Chantal Abergel<sup>2</sup>

<sup>1</sup>Department of Chemical Sciences, University of Naples. Naples. Italy.

<sup>2</sup>Information Génomique et Structurale, Centre National de la Recherche Scientifique-UPR 2589, Aix-Marseille University, IMM, Parc Scientifique de Luminy. Marseille. France.

<sup>3</sup>Department of Experimental Medicine and Center of Excellence for Biomedical Research, University of Genova. Genova. Italy

<sup>4</sup> Department of Agricultural Sciences, University of Naples. Naples. Italy.

**e-mail:**[anna.notaro@unina.it](mailto:anna.notaro@unina.it)

Recently, the traditional concept of viral glycosylation has been subverted by the evidence that giant viruses can independently glycosylate their capsid. Mimivirus is the most prominent example, as it has been established that the fibrils around the viral capsid are covered by complex glycans, synthesized by proteins encoded by the virus itself [1]. Mimivirus paved the way for the study of the fibrils' glycosylation of the *Mimiviridae* family. Here, I will present the complexity of the fibrils' glycosylation by combining two different approaches: on one hand the carbohydrate chemistry to elucidate the constituent sugars and on the other hand the bioinformatic search of the genes encoding the enzymes for their production and modification. Mimivirus, Moumouvirus australiensis and Megavirus chilensis were used as prototypes of the A, B and C clade respectively. The glycosylation genes are organized in cluster for Mimivirus (nine genes) and M. chilensis (six genes) [1], while the clade B remained unexplored [2]. As result, we have proved, first, the presence of sugars also for M. australiensis (B clade), and then the occurrence of a complex cluster of twelve genes explaining the *in vivo* data. In addition, we have extended the gene cluster of Mimivirus from nine to twelve genes, thus proving that Mimiviruses possesses all the enzymes for the sugars production and their modification.

Finally, a comparative proteomic analysis has revealed that the fibrils glycosylation is clade specific, except for the B clade in which a heterogeneous glycosylation occurs. Regarding the proposed genus *Tupanvirus* of the *Mimiviridae* [3], a bioinformatics research has identified the existence of a genomic region of 49 Kbp, in which at least 10 genes are involved in glycosylation, suggesting that even in this case the fibrils may be glycosylated. Definitively, the understanding of the glycosylation of the *Mimiviridae* family could be considered as a pilot study, which can be extended to other giant DNA viruses, such as Pandoravirus, Pithovirus, Mollivirus, a list in constant growth.

## References

- 1- Piacente, F., Marin, M., Molinaro, A., De Castro, C., Seltzer, V., Salis, A., Damonte, G., Bernardi, C., Claverie, J.-M., Abergel, C., et al. (2012). Giant DNA Virus Mimivirus Encodes Pathway for Biosynthesis of Unusual Sugar 4-Amino-4,6-dideoxy-d-glucose (Viosamine). *J. Biol. Chem.* 287, 3009–3018.
- 2- Piacente, F., De Castro, C., Jeudy, S., Molinaro, A., Salis, A., Damonte, G., Bernardi, C., Abergel, C., and Tonetti, M.G. (2014). Giant Virus Megavirus chilensis Encodes the Biosynthetic Pathway for Uncommon Acetamido Sugars. *J. Biol. Chem.* 289, 24428–24439.
- 3- Rodrigues, R. A. L., Mougari, S., Colson, P., La Scola, B., and Abrahão, J. S. (2019) “Tupanvirus”, a new genus in the family Mimiviridae. *Arch Virol.* 164, 325–331