

The EMBO workshop on Glycosylation at the Golgi Complex: Towards a New Cellular Glycobiology?

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Editorial

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Editorial

Unlike nucleic acids and peptides, glycans are template-free biopolymers. Their sequences are not *genetically determined*, but rather they *emerge* from the configuration of dedicated cellular synthetic machineries. Glycan assembly on proteins and lipids is accomplished along the biosynthetic pathway with the Golgi complex hosting about 200 different enzymes and additional accessory factors required for glycosylation. The subcellular organization of these enzymes and factors along with the regional provision of their substrates, which are both dictated by intracellular trafficking, largely shapes the cellular glycome. On the other hand, increasing evidence underlines the influence of specific glycans on membrane trafficking events along the secretory and endocytic pathways. This strict two-way relationship would suggest that glycosylation and membrane trafficking (at least that happening at the Golgi complex) should be the playground for a single scientific community.

In contrast to this prediction, scientists interested in glycosylation and in membrane trafficking at the Golgi complex have populated two distinct communities where exchanges between them have been occasional. As a consequence, membrane trafficking and glycosylation have developed into two independent and mature research fields. Thus on one side, membrane traffickers have managed to dissect the different molecular machineries responsible for vesicle formation, docking, and fusion at the Golgi complex. On the other, glycobiologists have cloned, and characterized, most Golgi resident glycosyltransferases with specific enzymatic activities ascribed to a given glycosyltransferase or to a discrete family of glycosyltransferases. As a consequence of these studies, we are now in the position to know substantially what a generic cargo will need in terms of molecular machinery

to traverse the Golgi and which glycosyltransferases and in which order will contribute to its glycosylation.

Nevertheless, we are left with some unanswered questions. For example: What is the impact of cargo trafficking dynamics and routes to its glycosylation? What is the influence of glycosylation on Golgi trafficking of cargoes? What are the causes and consequences of glycan heterogeneity? All these issues partly derive from the lack of exchange between the membrane trafficking and glycosylation communities and would be approached more effectively in a joint effort between them.

It was with these considerations in mind that we thought of organizing a meeting on 'Glycosylation in the Golgi complex'. In our view, such a meeting could indeed have served as a call to the two communities to overcome their artificial divide and to approach the urgent and common challenges of today's cellular glycobiology. In this spirit, we contacted a number of colleagues involved in the study of different aspects of Golgi associated glycosylation and trafficking. The response we got from this foray in the two fields was enthusiastic: Profs. Pamela Stanley and Alberto Luini, two well-established researchers in the fields of glycosylation and membrane trafficking respectively, agreed to our invitation to be co-organizers of the meeting and supported us with their experience. Profs. Jurgen Roth, AjitVarki, and Sean Munro accepted our invitation to be keynote speakers to provide an overview of the fields of glycosylation and Golgi membrane trafficking. Many of the invited speakers (20 in total) agreed to the presence of this artificial divide and were eager to communicate with the other side to overcome it. The *raison d'être* of having this meeting was indeed perfectly summarised in the words of Prof. Stanley 'I think such a workshop would be very timely

and would certainly stimulate beneficial discussions between those who study Golgi trafficking mechanisms and those who study Golgi glycosylation'.

We thus submitted a proposal to the European Molecular Biology Organization (EMBO) Courses and Workshops Programme following on which the EMBO Course Committee decided to fund our workshop entitled 'Glycosylation in the Golgi Complex' (<http://events.embo.org/16-golgi/>). Also thanks to the help of several other sponsors (The Journal of Cell Biology, The Mitzutani Foundation for Glycoscience, Nature Cell Biology, F1000, and the Institute of Protein Biochemistry at the National Research Council of Italy) the workshop was held in the Sorrento Peninsula (VicoEquense) in Italy from October 24th-28th, 2016. More than 100 scientists from 27 nations attended the workshop with 33 oral contributions and 67 posters.

As one would expect from leading researchers in established fields the individual contributions were of the highest level. Nevertheless, exposing good science was not the sole or even the principal outcome of this

meeting. The most interesting part of the workshop came during evening Round Table sessions. During these informal discussions, each of the two communities confronted themselves with the view the other had on the functioning of the Golgi complex. As a consequence, the different perspectives, working models and data accumulated by each community were subjected to critical scrutiny of the other and discrepancies emerged to challenge several established concepts. Nevertheless, when discomfort and uneasiness seemed to be at their peak it was when the exercise paid off.

Following on these discussions a number of 'unknowns' were finally acknowledged by scientists belonging to each of the communities that now faced an unexpectedly wide unexplored territory for future research. Whether or not '*those who study Golgi trafficking mechanisms and those who study Golgi glycosylation*' will join their forces to approach these issues remains to be seen. If and when it does happen we foresee the possibility for the development of a new field of cellular glycobiology.