



Title of the Meeting

Glycobiology & Glycochemistry e-learning course

Organization

Paula Videira

Head of Glycoimmunology Group

Chronic Diseases Research Center (CEDOC), Faculdade de Ciências Médicas (FCM),

Universidade Nova de Lisboa, Campo Mártires da Pátria 130, 1169-056 Lisboa,

Portugal

paula.videira@fcm.unl.pt

Amélia Pilar Rauter

Head of Carbohydrate Chemistry Group

Centro de Química e Bioquímica (CQB), Faculdade de Ciências da Universidade de

Lisboa

Lisbon October r 2012

Index

1) Summary	3
2) Description of the scientific content of and discussion at the event (up to 4 pages).....	4
List of Professors	4
3) Assessment of the results and impact of the event on the future direction of the field (up to 2 pages)	7
Scientific Results	7
Financial Results.....	8
4) Final programme of the meeting	9
Modules and themes.....	9
Appendix section.....	13

1) Summary

This report concerns the establishment of an e-learning course on Glycobiology and Glycochemistry. This interuniversity course is joining different but complementary contents on Glycosciences in order to provide students an overview of carbohydrates as an important class of molecular entities involved in numerous biological functions and clinical-therapeutic applications.

More than 30 professors were selected based on their scientific background in order to form a balanced panel of chemists and biologists, which also includes clinicians, pharmacologists, charity organizations, company members or other. They are from different countries and the lectures they give are recorded given priority to the contents while maintaining the distinction of the professors.

To foment the interrelation among people, the Professors are coming to Lisbon in small groups and if possible they are given the possibility to present their work in public seminars and to discuss with students. Besides the lectures we are also establishing partnerships and requesting permissions in order to complement the course with useful online resources such as e-books, scientific publications and other relevant web pages.

We believe this initiative will contribute significantly to enhance the outreach of Glycosciences to the broader scientific community, one of the priorities of the Network Program. In the future it is planned to complement the e-learning course with contents on general Medicine and Biology and to connect it with other University Programs already ongoing abroad

The e-learning format is designed to maximize the inclusion and learning of participants in any part of the world and an excellent opportunity to bring Glycoscience to non-Glycoscience experts.

2) Description of the scientific content of and discussion at the event (up to 4 pages)

The course has been approved by the scientific Committee from the Faculty of Medical sciences on the April 10th 2012 (approval document at the appendix section) and by the Steering Committee of the European Science Foundation (ESF) activity “Euroglycoscience forum” on April 24th 2012.

The students enrolling this course will have a diploma from two renowned Faculties, the Faculty of Medical Sciences from the Nova University of Lisbon and the Faculty of Sciences from The University of Lisbon.

Nearly 30 professors are coming from different countries, such as Portugal, Italy, France, Spain, Ireland, United States, United Kingdom, Denmark, Belgium, Japan, Germany and Norway, to participate voluntarily in this course. Presently, we have collected lectures from 16 professors. The lectures are recorded given priority to the topic and visualization of the contents, while maintaining the distinction of the professors.

In order to give time for video recording it is not practicable to bring all the professors at once. Nevertheless, in order to foment the discussion between the professors/researchers and students, the professors are being invited to come to Lisbon in small groups. Whenever possible they are given the possibility to present their work in public seminars as referred below, to discuss with students and other researchers and to participate in meetings.

Besides the lectures we are also establishing partnerships and requesting permissions in order to complement the course with useful online resources such as e-books, scientific publications and other relevant web pages. As an example we have had permission to use the contents of the book “Essentials of Glycobiology given by Professor Varki from the University of California, San Diego, USA.

List of Professors

1. **Margarida Amaral** – Faculdade de Ciências da Universidade de Lisboa, Portugal.
2. **Jesus Jiménez Barbero** - Centro de Investigaciones Biológicas, Consejo Superior de Investigaciones Científicas, Madrid, Spain.

3. **Christelle Breton** - Centre de Recherches sur les Macromolécules Végétales, Centre National de la Recherche Scientifique. Grenoble, France.
4. **Joy Burchel** - King's College London, UK.
5. **Bjorn Christensen** - Norwegian University of Science and Technology, Trondheim, Norway.
6. **Carlos Cordeiro** - Faculdade de Ciências da Universidade de Lisboa, Portugal, Portugal.
7. **Fabio Dall'Olio** - Faculty of Medicine, Bologna University, Italy.
8. **Philippe Delannoy** - Université des Sciences et Technologies de Lille, France.
9. **Anne Dell** - Imperial College, London, UK.
10. **Jeffrey Esko** - University of California, San Diego, USA.
11. **Ten Feizi** - Imperial College, London, UK.
12. **Vanessa Ferreira**, PhD – CDG Portuguese Association and other metabolic rare diseases (APCDG-DMR), Portugal.
13. **Sabine Flitsch** - University of Manchester, UK.
14. **Carlos Fontes** - Nzytech – Genes and Enzymes, Ltd, Portugal and Technical University of Lisbon, Portugal.
15. **Koichi Fukase** - Graduate School of Science, Osaka University, Osaka, Japan.
16. **Anne Imberty** - Glycobiologie Moléculaire CERMAV-CNRS.
17. **Joseph Lau** - Roswell Park Cancer Institute, Buffalo, USA.
18. **Stefan Oscarson** - University College Dublin, Ireland.
19. **Angelina Palma** - REQUIMTE/CQFB Departamento de Química, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal.
20. **Serge Perez** - Centre de Recherches sur les Macromolécules Végétales, Centre National de la Recherche Scientifique. Grenoble, France.
21. **Antoni Planas** - Universitat Ramon Llull, Spain.
22. **Amélia Pilar Rauter** - Faculdade de Ciências da Universidade de Lisboa, Portugal.
23. **Celso Reis** - Instituto de Patologia e Imunologia Molecular da Universidade do Porto, Portugal.
24. **Catherine Ronin** - SiaMed'Xpress, Université de Provence, Marseille, France
25. **Pauline Rudd** - University College Dublin, Ireland.
26. **Robert Sackstein**, -Director, Program of Excellence in Glycosciences, Harvard Medical School, USA.
27. **Richard Schmidt** - Universität Konstanz, Germany.
28. **Ajit Varki** - University of California, San Diego, USA.
29. **Paula Videira** - Faculdade de Ciências Médicas, Portugal.
30. **Hans H. Wandall** - University of Copenhagen, Denmark.
31. **Hans Peter Wessel** - F. Hoffmann-La Roche Ltd, Discovery Chemistry, Switzerland and University of Aveiro, Portugal.

3) Assessment of the results and impact of the event on the future direction of the field (up to 2 pages)

Scientific Results

As far as we know this is the first course in the field of Glycosciences, offered in such format. Given the characteristics of the Glycosciences, the Glycoscientists that participate in this course also belong to other disciplines such as Chemistry, Cell Biology, General pathology, Oncology, Immunology, and others. We successfully created a balanced panel of chemists and biologists, which also includes clinicians, pharmacologists, charity organizations and company members, as it can be seen on section “List of Professors” (Pag 3). In this way we will easily fulfill our commitment of building research capacity on Glycosciences and seed ground to translate emerging discoveries in Glycosciences into new diagnostics and clinical applications.

The e-learning format is designed to maximize the inclusion and learning of participants in any part of the world. However the other side of the coin is that the course would benefit from practical lectures and more student-to-professor contact. To overcome that we are planning the following:

- To offer selected students the possibility to join practical or advance courses that will be organized by us. At the moment we have one application submitted to the Federation of European Biochemical Societies (FEBS) course grant, with the proposal entitled “Advanced Course on Glycobiology & Glycochemistry: Applications to human health and disease”. This 5 day course intends to give students to possibility to have practical training in Glycosciences and it will also complement this e-learning course.
- To foster the participation of students in courses organized by the EuroGlycoscience Forum Network or other institutions.
- To build at the e-learning platform, a forum for discussion between students and professors. This functionality is already included offering the possibility to create this forum.
- To invite all the Professors to accept students for training at their research groups. We have already Portuguese students that are being co-supervised by the invited professors (e.g. Robert Sackstein and Joseph Lau).

Nevertheless, upon the preparation of the lectures, and since the Professors are arriving in small groups (2-4), interesting networking is being established. Presently, we have very recent collaborative publications such as the Review, “ID: biomolecules-22864 “Sialyl-Tn in cancer: (how) did we miss the target?” from a collaboration between Paula A Videira and Philippe Delannoy that has just been accepted by the Biomolecules journal.

The professors are given the possibility to present their work in public seminars.

As an example, the professor Jaak Jaeken was invited by the organization of this course and also by the CDG Portuguese Association and other metabolic rare diseases (APCDG-DMR) to participate in one day Symposium that they are organizing. The Symposium is entitled “SYMPOSIUM ON RARE DISEASES OF THE METABOLISM” and it will take place on December 14th 2012, at the faculty of Medical Sciences

Financial Results

The ESF has limited the amount of budget to 8000 Euros, instead of the 14500 Euros that were asked to the ESF during the application. Therefore, we have carefully evaluated the expenses needed to pay the audiovisual team, the online procedures and the traveling and lodging of all the teachers. The following steps are being taken to better start up the course:

1- The construction of this course is being guaranteed by a very competent audiovisual team from the Faculty of Medical Science, instead of an outsourcing team. Interestingly, while this has significantly reduced expenses with the recording of the lectures and preparation of the lectures, it has allowed our faculty to train their employees and reach a higher quality level of the available online courses.

2- We have asked the professors that were coming to Lisbon for other purposes and have taken the opportunity of their presence to record their lectures. This has saved us part of the travel expenses.

3- We have made an extensive survey to other institutions and some companies asking for their complementary support to this course. We have had some successfully achieved money from the “Fundação Luso Americana” (800 Euros), Mizutani Foundation (400 Euros), Nzytech (200 Euros), Pfizer and “L’Institut Français au Portugal” (800 Euros).

We have applied to the Federation of European Biochemical Societies (FEBS) course grant, with the proposal entitled “Advanced Course on Glycobiology & Glycochemistry: Applications to human health and disease”. This 5 day course intends to give students to possibility to have practical training in Glycosciences and it will also complement this e-learning course

Presently, we have recorded many lectures from 16 Professors. Future support will be critical to continue the course and to open the platform online.

4) Final programme of the meeting

The Glycobiology and Glycochemistry course is divided according to the modules and themes, described above.

Modules and themes

Introduction and course overview

Paula Videira & Amélia Pilar Rauter

Course details, overview of syllabus and evaluation

Why a Glycobiology & Glycochemistry e-learning course?

The Glycobiology & Glycochemistry forum

M1: Carbohydrate structure and nomenclature

Amélia Pilar Rauter, Isabel Sá-Correia (ISC)

Monosaccharide structure (APR)

Carbohydrate nomenclature (APR)

Carbohydrates in animals, plants and microbial cell walls (ISC)

M2: Biosynthesis, metabolism of carbohydrates

Paula Videira, Philippe Delannoy, Jeffrey Esko, Ajit Varki, João Rodrigues,

Christelle Breton

Cellular Organization of Glycosylation (PV)

Sugar nucleotides (PV)

N-glycans (PV)

O-glycans (PV)
Proteoglycans and Glycosaminoglycans (JE)
Glycosphingolipids (PD)
Glycophospholipid anchors (JR)
Gangliosides: structure, metabolism and functions (PD)
Biology and evolution of sialic acids (AV)
Biosynthesis of glycans: Focus on the large glycosyltransferase family (CB)

M3: Glycan-binding proteins

Ajit Varki, Anne Imberty, Jeffrey Esko, Serge Perez, Celso Reis, Robert Sackstein, Paula Videira

Introduction (PV)
Classification of Animal lectins (AI)
Structural aspects of protein-carbohydrates interactions (SP)
R- and L-type Lectins (PV)
P-type Lectins (PV)
C-type Lectins (PV)
I-type Lectins (AV)
Galectins (PV)
Glycan-mediated microbial adhesion: Hemagglutinins and Adhesins (CR)
Glycosaminoglycan-binding Proteins (JE)
Selectins (RS)

M4: Glycans in human physiological mechanisms

Joseph Lau, Paula Videira, Robert Sackstein

Glycoimmunology (PV)
Extrinsic pathway of glycosylation (JL)
Selectins and their ligands, focusing on the history and structural biology (RS)

M5: Glycans in human pathology

Jaak Jaeken, Vanessa Ferreira, Joy Burchel, Fabio Dall'Olio, Ten Feizi, Hans H. Wandall, Carlos Cordeiro

Congenital diseases of glycosylation (JJ)
Social impact of congenital diseases of glycosylation (VF)
Glycosylation and metastasis (JB)
Biosynthesis of cancer related carbohydrate antigens (FD)
Glycans in pathogen-host interaction (TF)
Glycan biomarkers (HHW)
Glycation and Neurodegenerative Diseases (CC)

M6: Methods in Glycosciences

Jesus Jiménez Barbero, Anne Dell, Angelina Palma, Serge Perez, Pauline Rudd, Richard Schmidt, Anne Imberty,

NMR and molecular recognition (JJB)
High sensitivity glycomics: glycan characterisation in health and disease (AD)
Highthroughput screening of glycan recognizing protein specificities (AP)
Principles of molecular modelling of complex carbohydrates (SP)
Structural and morphological features of celluloses and starch (SP)
Systems Glycobiology (PR)

Chemical/enzymatic glycosylation (RS)
Structural Glycobiology (AI)

M7: Glycoscience applications

Carlos Fontes, Stefan Oscarson, Antoni Planas, Catherine Ronin, Robert Sackstein, Hans Peter Wessel, Amélia Pilar Rauter, Sabine Flitsch

Commercial potential of the carbohydrate-active enzymes (CF)

Carbohydrate Vaccines (SO)

In vitro glycosidic bond formation: from glycosidases to glycosynthases (AP)

The glycosynthase technology for the preparation of oligosaccharides, glycoconjugates, and artificial polysaccharides (AP)

Glycoengineering of protein-based therapeutics (CR)

Glycoengineering (RS)

Industrial Drug Research (HPW)

Chemistry of monosaccharide functional groups (APR)

Small molecule therapeutics (APR)

Glycopeptides (SF)

Due to the economical constrains, our faculty has restricted the funds dedicated to the course. This has had an impact on the rapidity needed for the construction of the e-learning course, but will not ruin the construction itself.

However, we were assured to have the course online at the end of October. In the meantime we have been collecting, as much as lectures and contents as possible. These will be easily transferred to the e-learning *moodle* platform, which is already available at the faculty. The general website for the courses that are available at the faculty can be seen at:

http://www.fcm.unl.pt/main/index.php?option=com_content&view=article&id=214&Itemid=145

Some of the examples of the lectures that are already available were tentatively located at the dropbox platform.

<https://dl.dropbox.com/u/31806776/VIDEOS%20E-LEARNING%20para%20an%C3%A1lise/1%C2%AA%20PARTE%20Robert%20Sackstein.flv>

<https://dl.dropbox.com/u/31806776/VIDEOS%20E-LEARNING%20para%20an%C3%A1lise/Paula%20videira%201.flv>

<https://dl.dropbox.com/u/31806776/VIDEOS%20E-LEARNING%20para%20an%C3%A1lise/Joy%20Bucherell/Joy%20Bucherell%201%C2%BA%20parte.mp4>

Appendix section



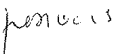
UNIVERSIDADE NOVA DE LISBOA
Faculdade de Ciências Médicas
Conselho Científico

Exma. Senhora
Prof.^a. Doutora Paula Videira
Gabinete de Estudos Pós-Graduados
Campo Mártires da Pátria
Lisboa

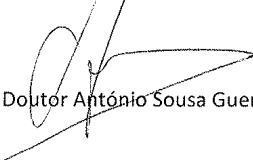
SUA REFERÊNCIA	SUA COMUNICAÇÃO DE	NOSSA REFERÊNCIA	DATA
Of. 2012-051GEPG	21-03-2012	Of.º nº 77/CC/2012	10-04-2012

ASSUNTO: **Proposta de Curso: Curso Pós-Graduado de Aperfeiçoamento "Glycobiology & Glycochemistry" – E-learning course.**

Informa-se V. Exa. que, na reunião do Conselho Científico do passado dia 3 de abril de 2012, foi aprovada por unanimidade, a proposta de criação de um curso pós-graduado de carácter internacional "Glycobiology & Glycochemistry", em sistema de *e-learning*.

Com os melhores cumprimentos, 

O Subdiretor, Presidente do Conselho Científico


(Prof. Doutor António Sousa Guerreiro)

rp