



## Exploratory Workshops Scheme

Standing Committees for:

- the European Medical Research Councils (EMRC)
- Life, Earth and Environmental Sciences (LESC)

# **Glycoscience Comes of Age**

**An ESF Exploratory Workshop on the  
Frontiers of Glycoscience**

**Thursday 24<sup>th</sup> – Saturday 26<sup>th</sup> May 2007**

**Hotel Koločep**

**'The Isle of Knowledge', Koločep, Dubrovnik, Croatia**



***Final Report***

***August 2007***

### ***Executive summary***

This workshop was primarily a networking and exploratory exercise rather than a workshop for presentation of scientific data or findings but this report summarises the areas of scientific expertise in the field of glycoscience and its possible applications that were covered during this workshop. Our aim was to cover as many disciplines in which glycoscience has, or may be expected to have, an impact in Europe. For this purpose we considered the following;

- The current State of the art in Glycoscience on a world wide basis
- European Strengths and Weaknesses in the glycosciences
- Potential ways to maximise the potential for the glycosciences in Europe
- Action plan to accomplish the aim of creating a unified plan for the promotion of Glycoscience in Europe

The workshop started with a series of presentations on the current State of the Art in the Glycosciences considering activities in the USA, Japan and in Europe as well as a view on the historical perspective of the field. The ESF Policy briefing document 27 Structural Medicine: The Importance of Glycomics for Health and Disease <sup>1</sup> was summarised and was used as a basis for discussion. A summary of the activities and ways in which the ESF can support such initiative was also given by Prof Glössl the ESF representative at the workshop.

There were then a series of breakout sessions which were intended to cover the strengths and weaknesses opportunities and threats to Glycosciences within Europe at the present time. This was divided into the following sessions;

*Breakout session 1: Structure and function of glycans*

*Breakout session 2: Microbial infection*

*Breakout session 3: Development*

*Breakout session 4: Markers for disease*

The discussions were far reaching and feedback reports were given by group facilitators for all the delegates. In general this part of the workshop achieved its purpose although there was a lot of discussion and it was apparent that some focus needed to be brought to plan for future activities.

The general conclusions were

- **Structure and function of glycans**
  - Europe has considerable strengths in this area both in terms of expertise and facilities but advice needs to be given on the most efficient and proper use of facilities (especially NMR) and there is concern that expertise will be lost as people retire. Notable strengths are in areas of polysaccharide and glycosaminoglycan analysis
- **Microbial infection**
  - This area is of high importance and should be a major thrust of future work. There is a great deal of expertise in this area and collaboration and cooperation between centres would give a world class resource with many potential applications in the field of human health
- **Development**
  - High level and broad range of expertise as well as involvement with industry. Embryonic stem cell research was also recognised as a specific area where for some EU countries there are special opportunities for research. There is general interest in the process of differentiation and de-differentiation (or arrested differentiation) and how this occurs during development and the progression of disease (particularly cancer). This area needs better support from the EU

- **Markers for disease**

- Seen as an area of high relevance to medicine and public health. Many carbohydrate markers exist but they need better validation. Difficult to introduce new markers but good facilities and collaborations involving major medical centres exist. Need to publicise and develop large scale trials for new or additional markers for major diseases

The next part of the workshop- sought to do this by looking at the establishment of centres of excellence or of a European Core Glycoscience Facility which could be either in a virtual form or be physical locations. Once more this was organised as a series of breakout sessions and this time the topics chosen were

- Analytical Core
- Synthesis Core
- Medical/Diagnostic Core
- Array and Nanotechnology Core
- Bioinformatics Core

There was considerable debate but a general consensus was reached that Glycosciences in Europe should be represented by a single body and that that body should be the Glycosciences Forum. This was established in the UK in 2005 but its aims were not restricted to national matters nor was there any restriction on membership. Indeed the 1<sup>st</sup> international workshop was held by the Glycosciences Forum in 2005 in London and the current workshop is seen as the second in this series. It was therefore resolved to make appropriate changes to the executive committee of the Glycosciences Forum to reflect the interest of all countries in Europe. The delegates were very aware that such a small group as present at the meeting could not speak for all the potential interested parties in Europe so it was also agreed that they would be consulted on the proposal. This has since been done and there have been no objections. The Forum therefore has a mandate to represent all aspects of Glycosciences in across Europe both in EU and non-EU countries and it is proposed to rename it The Euroglycosciences Forum.

Finally there was discussion on future activities. Prof Glössl gave information about forms of funding that might be available through the ESF either directly or in cooperation with national funding bodies. It was agreed that an ESF networking grant should be applied for in 2007 and this is now in progress and will be submitted at the end of October. Other sources of funding under the FP7 programme were also discussed and it was noted that the Marie Curie programme could provide an excellent resource for training in this area which is important as the skills are only available in few Institutions throughout Europe.

Feedback indicated that most delegates found the meeting was very useful and productive, that the location was ideal and conducive to discussion and that it would be very worthwhile to follow up this event in future with regular workshops of this kind on an annual basis to monitor progress.

## **1. Scientific content of the event**

This meeting was one for policy discussion rather than a scientific one none the less several scientific areas both in the Glycosciences and also several disciplines which are related to or have an interest in glycoscience were covered in outline and a summary of these are given below.

The meeting started with a series of presentations of current initiatives worldwide in the glycosciences. A presentation was given by Dr Stuart Haslam (Leader Analytics Group) on the US Glycomics consortium lead by Prof James Paulson which highlighted the fact that this consortium is focussed on finding how protein-carbohydrate interactions mediate cell communication. The point was made that this consortium had a further fixed term funding for 5 years with no possibility of extension and perhaps continuation of some of the facilities through activities in Europe could be considered.

The ways in which the ESF can support and encourage such activities and those under discussion and the funding mechanisms available were presented by the ESF representative at the workshop, Prof Josef Glössl from Vienna. The activities of the Japanese consortium under the human proteomic initiative was also described by Professor Nayouki Taniguchi (Chair of the HUPO, Japan) who showed the wide range an extensive expertise available there both for basis and applied research but some possibilities for joint student training programmes could be considered

The historical background to glycosciences in Europe was presented by Prof Nathan Sharon who pointed out many key discoveries were made in Europe and that there was a wealth of expertise in a variety of areas that should be fully exploited particularly in the field of microbial interactions. Funding to support existing facilities where there was a risk of losing valuable expertise and experience through retirement was an important consideration. Finally the ESF policy document of Glycoscience in Health and Disease<sup>1</sup> was presented by Prof. Hans Kamerling and he hoped the workshop would provide a platform for the discussion of many of the points raised in that document.

Breakout sessions were organised in the following areas;

- Structure and function of glycans
- Microbial infection
- Development
- Markers for disease

The strengths, weaknesses, opportunities and threats in each of these areas were considered in a European context and useful discussions followed this.

The idea of a European Core Glycoscience Facility was then discussed with a view to considering what areas this should cover, what the requirements were and what is currently available. The following cores were considered;

1. Analytical Core
2. Synthesis Core
3. Medical/Diagnostic Core
4. Array and Nanotechnology Core
5. Bioinformatics Core

It is felt that this workshop has set a useful framework for bringing together the scientific community who have an interest in glycosciences in Europe and it is hoped that it will form a basis for a unified body for representing glycoscience in the scientific community in a coordinated manner. It showed the great breadth of expertise in glycoscience which exists in Europe at the current time but also the need to safeguard and to capitalise on the wealth of talent and expertise which is available within the current community.

A coordinated forum would allow the most efficient use of all available resources in Europe and improve our competitive edge as well as providing a central point for information and contact for those who have an interest in Glycoscience.

A CD containing reports of all the breakout sessions, full details of participants, background material and publications and links to relevant organisations will be produced and circulated to all participants. Further copies will be available on request to the organisers.

## **2. Assessment of the results, contribution to the future direction of the field**

The workshop was generally very successful with the achievement of its major objectives of reviewing the state of glycoscience in Europe and how a coordinated approach can be achieved and who should be involved.

The main actions coming from the workshop were;

- 1) Amalgamation of all information about, and promotion of, glycosciences in Europe through the Euroglycoscience Forum
- 2) Changes to be made in the Executive Committee to reflect this with representative across Europe
- 3) Membership to the forum to be open to all with an interest in Glycosciences upon payment of a nominal membership fee
- 4) A concerted approach to funding applications to be made
- 5) The need for better and more widespread training in the field was recognised
- 6) Cooperation and collaboration with other international groups rather than competition
- 7) Increased involvement of industry with glycoscience to be encouraged
- 8) The needs of medical research need to be considered and the important role that glycoscience can play in medicine should be highlighted
- 9) Increased lobbying for glycosciences should take place both at a national and European level
- 10) The general scientific community should be more aware of glycosciences. Publications, presentations and representations to scientific bodies need to be made

Specific actions in funding applications

- a. Formulate a proposal for ESF EUROCORES proposal (2008 call)
- b. Prepare a proposal for an ESF Research Networking Programmes Grant (Closing date 30<sup>th</sup> October 2007)
- c. Apply for Marie Curie Research Training Network Grants in 2008 as appropriate
- d. Make further applications to the FP7 programme (specific calls to be evaluated on publication of call details)

There was a strong feeling that a focus for research activities is needed and that this should be in the area of glycoscience in infection and disease but no general consensus on this was reached at the workshop. Alternative proposals were to keep a broader interest which could encompass the importance of glycoscience in health and disease as covered in the ESF policy briefing. It was decided that the final decision should be taken at a later stage by the new Executive Committee of the Glycosciences Forum with proposals made for approval by the Forum members.

### 3. Final programme

## ESF Exploratory Workshop – Glycoscience Comes of Age

### WORKSHOP PROGRAMME

#### WEDNESDAY, MAY 23<sup>RD</sup>

20:00 **Welcome reception/buffet, Hotel Koločep**  
**Introductions, informal discussion**

#### THURSDAY, MAY 24<sup>TH</sup>

Chairs: **T. Merry and G. Lauc**

09:00 – 09:15 **G. Lauc** (Croatia)  
**Welcome address**

09:15 – 09:35 **J Glössl (LESC Standing Committee Member)** (Austria)  
**ESF**

09:35 – 09:45 **T. Merry** (U.K.)  
**Aim of the Workshop and program overview**

09:30 – 10:15 **N. Sharon** (Israel)  
**A Historical Perspective and the Current State of the Art in Glycoscience**

10:15 – 10:45 **S. Haslam** (UK, Director of the Consortium for Functional Glycomics Analytical Core)  
**The Consortium for Functional Glycomics: Goals and Activities**

10:45 – 11:00 COFFEE BREAK

11:00 – 11:30 **N. Taniguchi** (Japan)  
**Human Disease Glycomics Proteome Initiative (HGPI) and the Japan Consortium for Glycobiology and Glycotechnology (JCGG)**

11:30 – 12:00 **H. Kamerling** (The Netherlands)  
**European Science Foundation Policy Briefing on Glycoscience**

12:00 – 12:30 **plenary discussion: Carbohydrate-mediated interactions**  
Moderator: **H. Vliegthart** (The Netherlands)

12:30 – 14:30 LUNCH / DISCUSSION

14.30 – 17.30 **Breakout Sessions**

– **Analysis of European Strengths Weaknesses Opportunities Threats**

**Breakout session 1: Structure and function of glycans**

Moderators: **A. Imberty (France) and I. Wilson (Austria)**

**Breakout session 2: Microbial infection**

Moderators: **J. Finne (Finland) and J-C Michalski (France)**

**Breakout session 3: Development**

Moderators: **C. Merry (U.K.) and P. Delanoy (France)**

**Breakout session 4: Markers for disease**

Moderators: **P. Rudd (Ireland) and K. Zwierz (Poland)**

17:30 – 19:00 FREE TIME

19:00 – 21:00 DINNER AT HOTEL KOLOCEP / DISCUSSION

**FRIDAY, MAY 25<sup>TH</sup>**

9.00 – 10:30 **Breakout SWOT analysis sessions 1 to 4 – continued**

9:00 – 9.15 **Reports from SWOT-analysis sessions**

Chair: H. Vliegthart (Netherlands)

9.15 – 9.30 **A. Imberty (France) I. Wilson (Austria)**  
**Breakout session 1 - Structure and function of glycans**

9.30 – 9:45 **J. Finne (Finland) J-C Michalski (France)**  
**Breakout session 2 - Microbial infection**

9.45 – 10.00 **C. Merry (U.K.) and P. Delanoy (France)**  
**Breakout session 3 - Development**

10.00 – 10:15 **P. Rudd (Ireland) K. Zwierz (Poland)**  
**Breakout session 4 - Markers for diseases**

10:15 – 10:30 **Concluding remarks on European SWOT analysis**

**H. Vliegthart** (The Netherlands)

10:30 – 11:00 COFFEE BREAK

**European Core Glycoscience Facility (ECGF)**

11:00 – 11:15 **H. Kamerling** (The Netherlands)  
Introduction to the proposed European Core Glycoscience Facility

11:30 – 13:00 **Breakout sessions – ECFG**

Breakout session 1: **Analytical Core**

Moderators: R. Geyer (Germany) and O. Holst (Germany)

Breakout session 2: **Synthesis Core**

Moderator: N. Bovin (Russia) and O. Hindsgaul (Denmark)

Breakout session 3: **Medical/Diagnostic Core**

Moderator: G. Lauc (Croatia) and R. Gerardy-Schahn (Germany)

Breakout session 4: **Array and Nanotechnology Core**

Moderator: T. Feizi (UK) and S. Pernandes (Spain)

Breakout session 5: **Bioinformatics Core**

Moderator: W. van der Lieth (Germany)

13:00 – 14:30 LUNCH AT HOTEL KOLOCEP/ DISCUSSION

14:30 – 21:00 EXCURSION TO DUBROVNIK FOLLOWED BY MEETING DINNER IN DUBROVNIK  
(TRANSPORT BACK TO HOTEL)

**SATURDAY, MAY 26<sup>TH</sup>**

**Chair: H. Kamerling**

**Reports from ECGF Breakout sessions**

09:00 – 09:15 **R.Geyer** (Ireland) and **O. Holst** (Germany)  
Breakout session 1 – **Analytical Core**

09:15 – 09:30 **N. Bovin** (Russia) and **O. Hindsgaul** (Denmark)  
Breakout session 2 – **Synthesis Core**

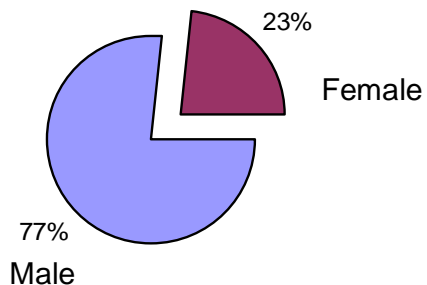
09:30 – 09:45 **G. Lauc** (Croatia) and **R. Gerardy-Schahn** (Germany)  
Breakout session 3 - **Medical/Diagnostic Core**



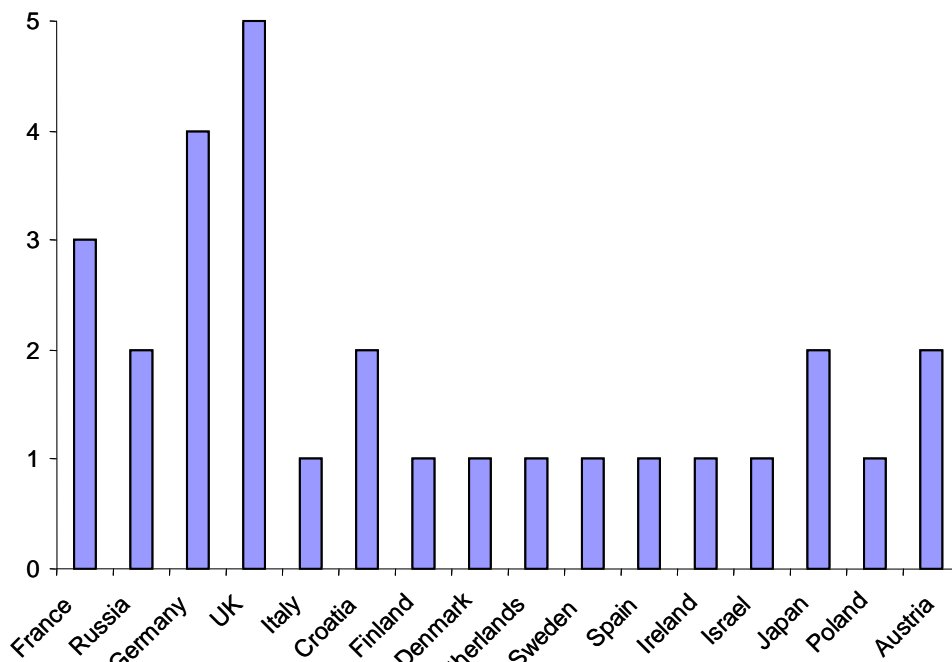
- 09:45 – 10:00 **T. Feizi** (UK) and **S. Penadés** (Spain)  
Breakout session 4 – **Array and Nanotechnology Core**
- 10:00 – 10:15 **W. van der Lieth** (Germany)  
Breakout session 5 - **Bioinformatics Core**
- 10:15 – 10:45 **O. Hindsgaul** (Denmark)  
**Conclusions and General Discussion on ECGF**
- 10:45 – 11:15 COFFEE BREAK
- 11:15 – 11:30 **T. Merry** (U.K.)  
The Glycoscience Forum
- 11:30 – 11:45 **H. Vliegthart** (The Netherlands)  
European Glycoscience Forum
- 11:45 – 13:45 **General discussion of future actions and initiatives**
- 13:45 – 14:00 **G. Lauc** (Croatia)  
**Conclusions / Future actions**
- 14:00 – 15:00 LUNCH and FAREWELL

## 4. Statistical information on participants

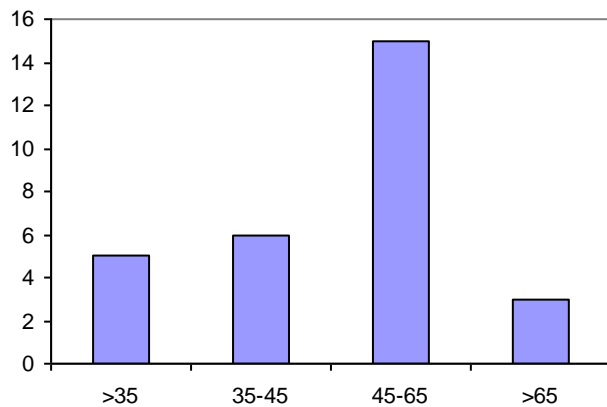
### 4.1. Distribution by Gender



### 4.2. Distribution by Country



### 4.3. Distribution by Age



## 5. The Final list of participants (full name and affiliation)

Title	Name	Last Name	Country	Affiliation
Prof	David	Bonaffe	France	Laboratoire de Chimie Organique Multifonctionnelle, CNRS-Université Paris Sud,
Prof	Nicolai	Bovin	Russia	Head of Carbohydrate Chemistry lab, Shemyakin Institute of Bioorganic Chemistry RAS, Moscow
Dr	Stefan	Hinderlich	Germany	Charité Universitätsmedizin Berlin
Prof	Phillippe	Delanoy	France	Unité de Glycobiologie Structurale et Fonctionnelle Lille
Dr	Stuart	Haslam	UK	Faculty of Natural Sciences, Department of Life Sciences, Imperial College London
Dr	Jerka	Dumic	Croatia	University of Zagreb
Dr	Sergio	di-Virgilio	EU	Scientific Officer, European Commission Research Directorate General Directorate - Marie Curie Networks
Prof	Ten	Feizi	UK	MRC Glycosciences Laboratory, Division of Medicine, Faculty of Medicine, Imperial College London
Prof	Jukka	Finne	Finland	Department of Medical Biochemistry and Molecular Biology, University of Turku
Prof	Rita	Gerardy-Schahn	Germany	MH-Hannover: Hannover Biomedical Research School (HBRS) University of Hannover
Prof	Rudolf	Geyer	Germany	Institut für Biochemie, Universitätsklinikum Gießen und Marburg
Prof	Ole	Hindsgaul	Denmark	Carlsberg Research Center, Copenhagen
Prof	Otto	Holst	Germany	Division of Structural Biochemistry at Research Center Borstel and University of Lübeck
Prof	Anne	Imberty	France	Centre de Recherches sur les Macromolécules Végétales CERMAV Grenoble
Prof	Hans	Kamerling	Netherlands	Universiteit Utrecht Bijvoet Centrum, Bio-Organische Chemie / Glycoscience and Biocatalysis
Dr	Yury	Knirel	Russia	ND Zelinsky Institute of Organic Chemistry, Moscow
Prof	Gordan	Lauc	Croatia	University of Osijek School of Medicine
Prof	Peter	Påhlsson	Sweden	Cellbiologi, Linköpings universitet
Dr	Tony	Merry	UK	Glycosciences Consultancy
Dr	Cathy	Merry	UK	School of Materials, University of Manchester
Prof	Soledad	Penades	Spain	Laboratory of Glyconanotechnology, CICbiomaGUNE, Parque Tecnológico de San. Sebastian
Prof	Thomas	Peters	Germany	Institute of Chemistry, Universität zu Lübeck
Prof	Pauline	Rudd	Ireland	National Institute for Bioprocessing Research and Training (NIBRT) and University College Dublin
Prof	Nathan	Sharon	Israel	Department of Biological Chemistry, Weizmann Institute of Science, Rehovot
Prof	Hans	Vliegenthart	Netherlands	Universiteit Utrecht Bijvoet Centrum, Bio-Organische Chemie / Glycoscience and Biocatalysis
Prof.	Naoyuki	Taniguchi	Japan	Chair of the Glycomics in Disease Scientific Initiative, Osaka University Graduate School of Medicine
Dr	Willi	Von der Lieth	Germany	DKFZ Heidelberg
Prof	Iain	Wilson	Austria	Universität für Bodenkultur Wien
Prof	Krzysztof	Zwierz	Poland	Akademia Medyczna w Białymstoku

27 September 2007

Dr Tony Merry, Executive Secretary, The Glycosciences Forum; Dr Gordan Lauc  
Organisers ESF European Glycosciences Workshop Glycosciences Comes of Age

<sup>1</sup> European Science Foundation Policy Briefing Document no 27 (July 2006) Structural Medicine: The Importance of Glycomics for Health and Disease