

# 28<sup>th</sup> Symposium on Glycosaminoglycans

September 27<sup>th</sup> – 29<sup>th</sup>, 2021



## Organizers:

Giangiaco<sup>m</sup>o Torri and Annamaria Naggi  
"G. Ronzoni" Institute for Chemical and Biochemical Research,  
Milan, Italy

Job Harenberg and Roland Krämer  
University of Heidelberg, Germany

## **Welcome to San Servolo Island 2021!**

Following the interruption last year due to the pandemic, the series of annual Symposia resumes with the 28<sup>th</sup> edition, which will take place on San Servolo Island, in Venice Lagoon. Eminent specialists from all over the world are invited to discuss both current and emerging topics of interest in the fields of chemistry, biochemistry, biology, pharmacology, and in the clinical applications of heparin and other glycosaminoglycans. In particular, sessions devoted to COVID-19 and Glycosaminoglycan Research, as well as others covering both basic and applied research aspects have been considered. The subjects of interest cover biosynthesis, structural characterization and protein interactions, biological functions, pharmaceutical and clinical aspects including anti-inflammatory and anti-tumor activity.

The symposium will have a hybrid character, allowing both in-presence and virtual participation. However, as per tradition, participation is only by invitation.

Keynote speakers will outline state-of-the art, research and advances in each field and present novel results and future perspectives. A sufficient time will be allotted for in-depth discussion. The informal, workshop-like character of the symposia and the pleasant surroundings of San Servolo will stimulate the traditional after-session interactions among participants as in the past twenty-seven editions.

Job Harenberg

Giangiaco Torri

### **Scientific board**

Job Harenberg, Giangiaco Torri, Roland Krämer, Ram Sasisekharan, Annamaria Naggi, Marco Guerrini, Gerd Bendas, Martin Götte.

### **Scientific Secretary**

Antonella Bisio

**Monday, September 27<sup>th</sup> 2021**

13.30 – 14.30 **Lunch**

15.00 – 15.10 **Welcome address, Job Harenberg and Giangiacomo Torri**

**COVID-19 PANDEMIC AND GLYCOSAMINOGLYCAN RESEARCH**

Moderator: **Edwin Yates**

15.10 – 15.30 **Jeffrey Esko**, San Diego  
SARS-CoV-2 infection depends on cellular heparan sulfate.

15.30 – 15.50 **Mark Skidmore**, Keele  
Heparin inhibits cellular invasion by SARS-CoV-2.

15.50 – 16.10 **Marco Guerrini**, Milan  
First insights into the molecular recognition mechanisms of SARS-CoV-2 spike protein and glycosaminoglycans.

16.10 – 16.30 **Discussion**

16.30 – 16.50 **Coffee and tea**

**COVID-19 PANDEMIC AND GLYCOSAMINOGLYCAN RESEARCH**

Moderator: **Giangiacomo Torri**

16.50 – 17.10 **Benilde Cosmi**, Bologna  
Low molecular weight heparin for thromboembolic complication of COVID-19.

17.10 – 17.30 **Job Harenberg**, Heidelberg – **Alejandro Gonzalez-Ochoa**, San Luis Rio Colorado – **Jawed Fareed**, Chicago.  
Oral sulodexide reduces the adverse outcomes in COVID-19 infections.

17.30 – 17.50 **Jeremy Turnbull**, Liverpool  
Synthetic heparan sulfate mimetic pixatimod (PG545) potently inhibits SARS-CoV-2 by disrupting the spike-ACE2 interaction.

17.50 – 18.10 **Discussion**

20.00 **Welcome cocktail**

20.30 **Dinner**

**Tuesday, September 28<sup>th</sup> 2021**

## **THE MULTIFACETED ROLES OF HEPARANASE**

Moderator: **John Gallagher**

- 9.00 – 9.20 **Jin-ping Li**, Uppsala  
Heparanase overexpression impedes perivascular clearance of amyloid- $\beta$  from murine brain. Relevance to Alzheimer's disease.
- 9.20 – 9.40 **Giuliana Cassinelli**, Milan  
Targeting heparanase/heparan sulfate proteoglycans in sarcomas.
- 9.40 – 10.00 **Noemi Veraldi**, Geneva  
Targeting Heparanase to decrease lysosomal accumulation of heparan sulfate fragments in Sanfilippo syndrome.
- 10.00 – 10.20 **Israel Vlodavsky**, Haifa  
Role of heparanase-2 (Hpa2) in tumor suppression and normal development.
- 10.20 – 10.40 **Maurice Petitou**, Milan  
Some approaches towards heparanase inhibitors.
- 10.40 – 11.00 **Discussion**
- 11.00 – 11.20 **Coffee and tea**

## **NEW ANALYTICAL APPROACHES**

Moderator: **Martin Götte**

- 11.20 – 11.40 **Pierre Mourier**, Vitry sur Seine  
Specific non-reducing ends in heparins from different animal origins: building blocks analysis using reductive amination tagging by sulfanilic acid.
- 11.40 – 12.00 **Elena Vismara**, Milan  
Heparin engineered super paramagnetic iron oxide nanoparticles for theranostic applications.
- 12.00 – 12.20 **Jawed Fareed**, Chicago – **Roland Krämer**, Heidelberg  
Absolute quantification of heparin and related glycosaminoglycans by heparin red and LC MS methods.
- 12.20 – 12.40 **Discussion**
- 13.00 – 14.00 **Lunch**

Tuesday, September 28<sup>th</sup> 2021

## NEW ANALYTICAL APPROACHES

Moderator: **Gerd Bendas**

- 14.30 – 14.50 **Richard Karlsson**, Copenhagen  
Towards comprehensive analysis of 3-O-sulfation in heparin and heparan sulfate.
- 14.50 – 15.10 **Andrew Hook**, Nottingham  
Whole molecule analysis of glycosaminoglycans (GAGs) by secondary ion mass spectrometry (SIMS), detecting GAG contaminants within heparin.
- 15.10 – 15.20 **Discussion**

## PHARMACEUTICAL AND REGULATORY ASPECTS

Moderator: **Marco Guerrini**

- 15.20 – 15.40 **Jawed Fareed**, Chicago  
An update on bovine, ovine and porcine heparin and enoxaparin.
- 15.40 – 16.00 **Sandra Blome**, Greifswald - Insel Riems  
African swine fever and its impact on products derived from pigs.
- 16.00 – 16.20 **Coffee and tea**
- 16.20 – 16.40 **Ali Al-Hakim**, Gaithersburg  
General considerations for diversifying heparin drug product by improving the current heparin manufacturing process and reintroducing bovine sourced heparin to the US market.
- 16.40 – 17.00 **David Keire**, St. Louis  
Clearance of prion infectivity through bovine heparin processing.
- 17.00 – 17.20 **Lorenzo Montrasio**, Strasbourg  
Access to treatments in a context of scarce resources.
- 17.20 – 17.40 **Discussion**
- 20.00 **Dinner**

Wednesday, September 29<sup>th</sup> 2021

## GLYCOSAMINOGLYCAN INTERACTIONS

Moderator: **Carl Kirchmaier**

- 9.00 – 9.20 **Jacob van den Born**, Groningen  
GAGs as inhibitors of the complement system. A special focus on the MASP-2 protease.
- 9.20 – 9.40 **Kay Grobe**, Münster  
Two binding sites are required for direct Hedgehog morphogen relay from one heparan sulfate chain to the next.
- 9.40 – 10.00 **Susanne Alban**, Kiel  
New insights into fucoidans from brown algae.
- 10.00 – 10.20 **Discussion**
- 10.20 – 10.40 **Coffee and tea**

## HEPARIN AND OTHER GLYCOSAMINOGLYANS IN MALIGNANCY

Moderator: **Job Harenberg**

- 10.40 – 11.00 **Martin Götte**, Münster  
Role of the heparan sulfate proteoglycan Syndecan-1 in the tumor microenvironment.
- 11.00 – 11.20 **Gerd Bendas**, Bonn  
The potency of synthetic heparin mimetics to inhibit tumor-host cell interaction.
- 11.20 – 12.10 **General discussion**
- 12.10 – 12.20 **Closing remarks: Giangiacomo Torri and Job Harenberg**
- 13.00 – 14.00 **Lunch**

## Location of the Symposium

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