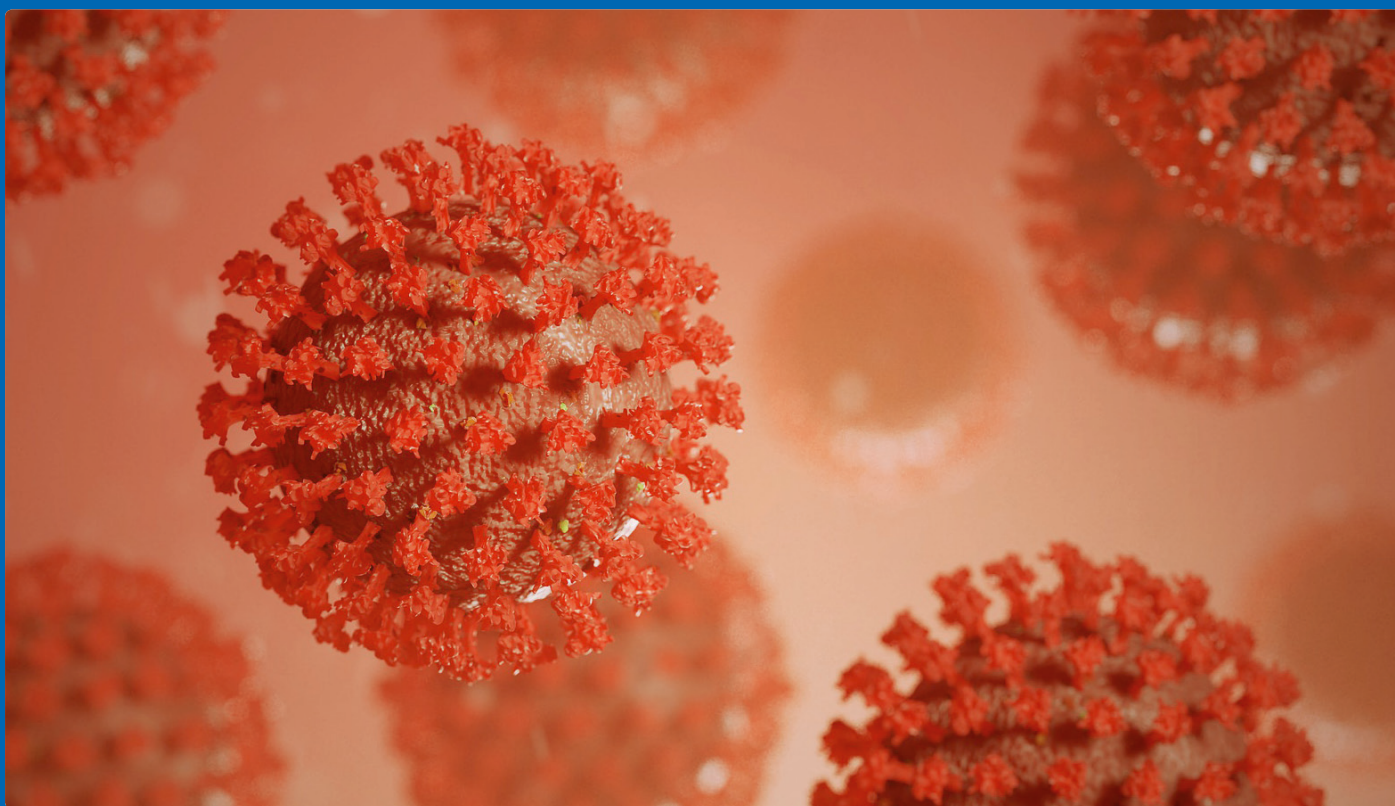


Welcome to the second newsletter edition of the MSCA-ITN project synBIOcarb! We are delighted to provide you with news from our training network activities and to update you on project highlights in the exciting field of synthetic glycobiology! We are happy to keep you posted and we hope that you enjoy reading.

Yours sincerely, synBIOcarb Team



## synBIOcarb – A training network in times of COVID-19

synBIOcarb is a European Training Network in the frame of the Marie-Skłodowska-Curie program (H2020-MSCA-ITN), approaching its third year of project duration already.

A diverse team of chemists, structural biologists, biophysicists, cell biologists and protein engineers from across Europe provides 15 early stage researchers (ESRs) with advanced scientific training in enabling technologies that underpin the development and exploitation of glycoscience for diagnostics and targeted drug delivery.

Due to the COVID-19 pandemic, the synBIOcarb team was forced to transfer their networking and training activities completely to the virtual room – a challenge, but the team definitely made the best out of it! Therefore, they proudly look back to a year full of online training events, online conference participations, online scientific publications, ESR videos on Youtube and even an online public event in the frame of the European Researchers' Night!

Further information on <https://synbiocarb.science>



**WENYUE (EVA) DAI**  
UNIVERSITY OF LEEDS

**ESR PROJECT TITLE:**

Engineering Multimeric AB<sub>5</sub> lectin complexes for membrane fusion

**MY CONTRIBUTION TO SYNBIOCARB AND MEASURES TO MEET THE OBJECTIVES:**

The focus of my project is to extend our understanding of the relationship between the architecture of AB<sub>5</sub> bacterial toxins and their ability to fuse membranes. More specifically, my goal is to homo- and hetero-oligomerize AB<sub>5</sub> bacterial toxin in a way that the relative orientation of the binding modules and the distances between domains are controlled. This would help us investigate the structural requirements for membrane fusion.

**MY PERSONAL EXPERIENCES:**

I am hosted at the University of Leeds and find my scientific passion here. My supervisors encouraged me to explore the area I am interested in, with diverse resources available in University. So far as my project, designing my own proteins and testing them in the lab gives me a sense of accomplishment.

**MY OPINION ABOUT THE MSCA-ITN PROGRAM:**

MSCA-ITN supports a network in which the researchers from different institutes and businesses and with a diverse scientific background are connected, which not only enhances cooperation between organizations but also builds up a stronger network for individuals.

**MY BENEFITS FROM SYNBIOCARB:**

The synBIOcarb supports a platform for researchers in varying fields to work more closely – We can seek for help from experts in more disciplines or explain the same phenomenon from different angles. We have training events every half year, where I could get a more comprehensive knowledge of synthetic glycobiology through seminars on different topics. Moreover, I can improve my transferrable skills, such as writing, presenting, video making, and social skills to expand our audiences from academia to public.



**LINA SIUKSTAITE**  
UNIVERSITY OF FREIBURG

**ESR PROJECT TITLE:**

Basic mechanisms and applications of lectin-triggered membrane fusion

**MY CONTRIBUTION TO SYNBIOCARB AND MEASURES TO MEET THE OBJECTIVES:**

As a young researcher, I aim to understand which parameters drive the fusion of artificial and living cell membranes. This can be used as a platform for targeted drug delivery, for example, to fight cancer. Therefore, I am testing diverse glycoconjugates with engineered sugar-binding proteins - lectins by using cell prototypes - liposomes.

**MY PERSONAL EXPERIENCES:**

Before the studies, I had never visited Freiburg before, but I immediately fell in love with the city's atmosphere and local culture once I came here. Freiburg is also a gate to the stunning Black forest and mountains with endless hiking paths. The study environment is stimulating because it is highly interdisciplinary and multicultural. Very supportive and friendly colleagues surround me, and I am continually learning new approaches and getting more and more knowledge in the field. Besides, I am looking forward to the upcoming secondments to acquire knowledge from experts and advance my skills.

**MY OPINION ABOUT THE MSCA-ITN PROGRAM:**

This program gives an excellent opportunity for collaborations to expand the network between both academia and industry. Also, there are lots of possibilities given in developing new skills during various training and courses.

**ANY OTHER COMMENTS:**

I cannot wait for coronavirus to be over and meet everyone in person and travel again. It has been too long!



**FRANCESCA ROSATO**  
UNIVERSITY OF FREIBURG

#### **ESR PROJECT TITLE:**

Crosslinking cytotoxic T cells and cancer cells with lectins to mediate cell death

#### **MY CONTRIBUTION TO SYNBIOCARB AND MEASURES TO MEET THE OBJECTIVES:**

My project focuses on developing and applying lectins to crosslink T cells and cancer cells, leading to cancer cell death. It aims to investigate the impact of natural and synthetic lectins as cellular crosslinkers. The ultimate goal is to unleash the immune system against cancer, with high specificity in T cell activation and killing of cancer cells.

To help me reach the final goal, I established strong collaborations with the groups from the consortium: by merging tools and knowledge we will achieve the best results to meet the final aim.

#### **MY PERSONAL EXPERIENCES:**

Due to its interdisciplinary, the MSCA-ITN program was so far the best choice for my career. I have the opportunity to develop skills in many fields, such as cell biology, immunology, glycobiology, biochemistry, and use advanced techniques to meet my goals and become a fully trained scientist. The environment at the University of Freiburg is very stimulating and the team work is strong. This provides not only a great professional experience, but also an intense personal one. Thanks to the established collaborations within the network, I have the opportunity to learn techniques not available in our lab and expand the knowledge in many different fields.

#### **MY OPINION ABOUT THE MSCA-ITN PROGRAM:**

The program represents the perfect balance between the research in industries and in university. With a close look at both, the knowledge acquired during the three years is broad and much diversified. This is translated into good opportunities in both environments, which expands notably the possibilities of being a successful scientist in such a competitive world.

#### **MY BENEFITS FROM SYNBIOCARB:**

Besides the scientific training, the program offers the chance to improve a whole set of soft skills that are required to be a strong candidate in the future career: communication, writing, time management. The opportunity to travel across Europe and experience different laboratories and research group is the absolute strength of the program. Such collaborations are powerful and beneficial to every project, by stimulating discussion, planning, and mutual improvement.



**RAJEEV PASUPULETI**  
ACIB GMBH

#### **ESR PROJECT TITLE:**

Lectin-drug conjugates to induce cancer cell death by drug delivery.

#### **MY CONTRIBUTION TO SYNBIOCARB AND MEASURES TO MEET THE OBJECTIVES:**

Several studies found that cancer cells over express glycans on surface. On the other hand, it is well known that lectins are proteins which specifically bind glycans. So, our aim is to deliver anti-cancer drugs through lectins which can specifically target glycans on cancer cells.

Like antibody-drug conjugates, the preparation of homogeneous lectin-drug conjugates is a challenge, which can be met by using non-canonical amino acids (ncAAs) for selective lectin modification. We will site-specifically conjugate a cancer-specific lectin with an anticancer drug via reactive ncAAs and evaluate the efficacy of the lectin-drug conjugate in cell imaging and in cell viability.

#### **MY PERSONAL EXPERIENCES:**

Working in the core facilities of the host institution acib GmbH is a multicultural experience. Pursuing a PhD from Graz University of Technology and working at acib gave me an exposure to academic as well as an industrial perspective in science. Unfortunately, due to the pandemic restrictions, I couldn't start my secondments in the United Kingdom and Germany, but I am hopeful to start soon.

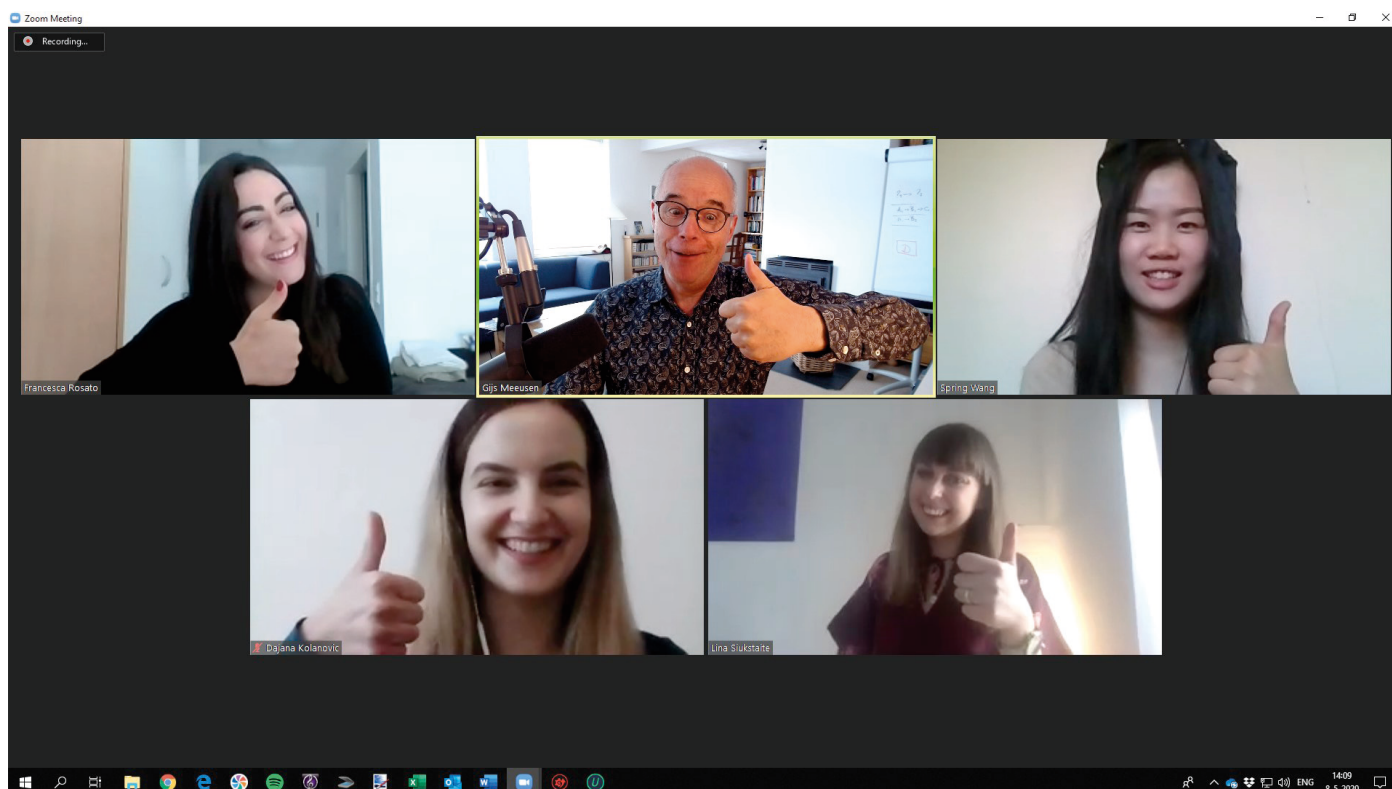
#### **MY OPINION ABOUT THE MSCA-ITN PROGRAM:**

The program provided me with an opportunity to learn and excel in advanced technologies in the field of synthetic and molecular biology. I hope to gain a world class laboratory experience while I will work for my secondments. Training events, presentations and workshops in the program are a great way to develop and enhance skills to self-manage and self-develop as an early-stage researcher.

#### **MY BENEFITS FROM SYNBIOCARB:**

It is an honour to be a part of this elite synBIOcarb team with an interdisciplinary expertise. It created an important platform to meet researchers from various European countries and helped to exchange knowledge, culture and languages.





## THE HIGHLIGHTS OF THE SECOND YEAR OF SYNBIOCARB

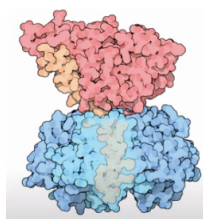
The second year of synBIOcarb was significantly impacted by the COVID-19 pandemic - not only in terms of limited physical networking opportunities but also in terms of scientific questions, the pandemic was a prevailing topic. As synBIOcarb intends to progress the state of the art in synthetic glycobiology by redesigning, synthesizing and exploiting the cell glycocalyx for analytical, diagnostic and targeted therapeutic applications, a connection was easily found: One of the ESRs developed an early strategy to use the glycosylation of SARS-CoV-2 in vaccination, while participating in a pan-European hackathon “EU versus virus” in April. Two other ESRs attended an online training session about SARS-CoV-2 glycobiology, which was organized by the Swiss Institute of Bioinformatics in April 2020.

A special highlight was the release of two new publications! On the one hand the paper “[Structure and engineering of tandem repeat lectins](#)” describes two very important families of sugar-binding proteins that are reminiscent of 5, 6 or 7-bladed propellers, or trefoil knots. These lectins have proven useful starting points for protein engineering projects to make novel sugar-binding proteins for applications in healthcare and biotechnology.

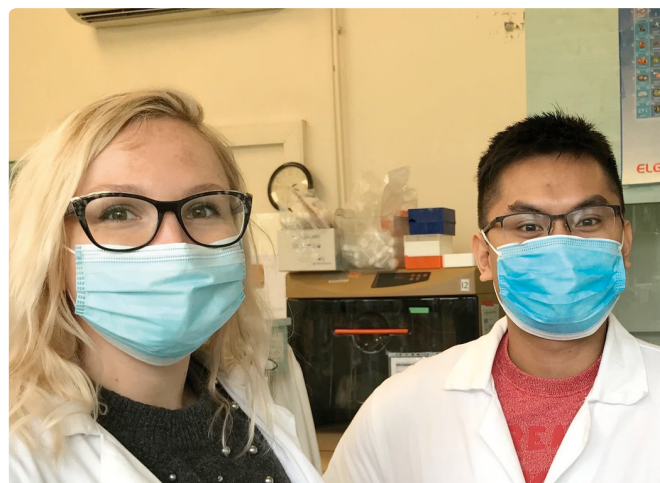
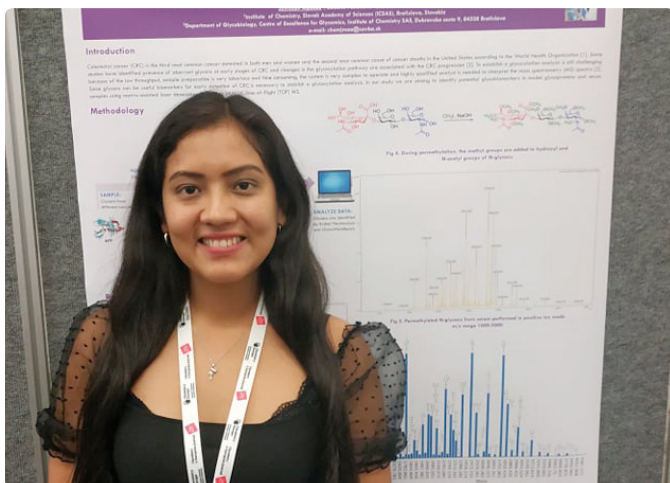
On the other published study “[The lectin LecA sensitizes the human stretch-activated channel TREK-1 but not Piezo1 and binds](#)

[selectively to cardiac non-myocytes](#)”, the team found out that the *Pseudomonas aeruginosa* lectin LecA can bind selectively to cardiac non-myocytes, altering the membrane topology and activating some types of stretch-activated ion channels (SACs). This important sugar-binding protein has potential as a useful tool to dissect the biological activities of SACs.

In terms of science communication, the ESRs have been very productive in filling the synBIOcarb Youtube channel with the series “[Diaries of a Scientific Researcher](#)”. ESRs are explaining their work in short videos, while gaining experience in science communication and improving their presentation skills. A couple of ESRs also attended an online training course of ARTESC’s Gijs Meeusen for six weeks, who was teaching advanced level writing and presentation skills.



## SYNBIOCARB ON VIRTUAL NETWORKING TOUR



### EU VS. VIRUS PAN-EUROPEAN HACKATHON, 24<sup>TH</sup> – 26<sup>TH</sup> APRIL 2020, ONLINE EVENT

The European Commission hosted this event to connect civil society, innovators, partners and buyers across Europe. The purpose of the event was to develop innovative solutions to overcome coronavirus-related challenges. ESR Wen Yue (Eva) Dai participated and developed a concept idea in order to address how lectins could play a part in antibody design for COVID-19.

### SARS-CORONAVIRUS-2 GLYCOBIOLOGY, 30<sup>TH</sup> APRIL 2020, ONLINE WEBINAR

The Swiss institute of Bioinformatics has streamed a webinar from Geneva, where Lina Suistaitte and Francesca Rosato got inspired for their own work.

### TE3 & STRUCTURAL GLYCOSCIENCE SUMMER SCHOOL, 17<sup>TH</sup> – 18<sup>TH</sup> JUNE 2020, ONLINE TRAINING

30 students including our synBIOcarb ESRs participated in a series of lectures and practical sessions. The comprehensive programme of activities covered important topics such as Protein X-ray Crystallography, Sugar Building, Nuclear Magnetic Resonance, Isothermal Titration Calorimetry and Solid-Phase Binding Assays. Students also engaged in live desk based practical work where they experimented with Sugar Molecular Dynamics and using databases such as a Protein-Ligand Interaction Profiler.

### GLYCOMICS, 25<sup>TH</sup> JUNE 2020, VIRTUAL POSTER SESSION

ESR Simona Notova based at CERMAV-CNRS in Grenoble, took her science across the ocean and participated in a virtual poster session of [Glycomics 2020](#) in Alberta, Canada. She presented her work about Janus lectins scaffold for double specificity.

### 72<sup>ND</sup> CONGRESS OF CZECH AND SLOVAK CHEMISTS, 6<sup>TH</sup> – 9<sup>TH</sup> SEPTEMBER 2020, PRAGUE, CZECH REPUBLIC

ESR Juvissan Ariza presented a poster about her work at one of the rare physical meetings in 2020. She was showing a MALDI-MS method for the discovery of glycan biomarkers in colorectal cancer. Unfortunately, her colleague, Paras Kundalia, could not attend at the end because of a quarantine situation.

### EUROPEAN RESEARCHERS' NIGHT "LIFE IS SCIENCE", 27<sup>TH</sup> NOVEMBER 2020, VIRTUAL OPEN EVENT

synBIOcarb partner acib has streamed this European-wide public event from a pop-up studio in Austria. The program under the thread "Life is Science" was a mix of live-sessions and pre-recorded explanatory videos about the topics "Health", "Renewable Resources" and "Food technology". synBIOcarb had its own section in "Health", where all "Diaries of a Scientific Researcher" have been presented.

## SYNBIOCARB EVENT CALENDAR:

**EUROCARB 2021,**  
**18<sup>TH</sup> - 22<sup>ND</sup> JULY 2021 (PARIS, FRANCE)**

oral presentation/Poster about „Janus lectins  
as a scaffold for double specificity“

### SYNBIONEWS EDITORIAL TEAM

**Coordinator:** Bruce Turnbull, Univ. Leeds • **Newsletter Text:** Bruce Turnbull, Univ. Leeds; Katrin Weinhandl, acib GmbH; synBIOcarb ESRs  
**Layout:** Dietmar Cseh, acib GmbH • **Pictures:** Pixabay, synBIOcarb • **Contact:** synBIOcarb@leeds.ac.uk • © by synBIOcarb 2021  
synBIOcarb has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement no. 814029