



# GAZETTE

## Skin & Formulation 6th Symposium

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18-21 March 2024

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## Skin & Formulation, 6th Symposium Current challenges in skin formulation

Nantes

2-3 October 2023



- ◆ Skin & Formulation, 6th Symposium - Current challenges in skin formulation, 2-3 October 2023, Nantes
- ◆ Info Day « Poorly soluble drugs: An industrial perspective on formulations for bio-availability enhancement 14 November 2023, Paris

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# Editorial



Dear Colleagues,

The *4th European Conference on Pharmaceutics* early this year in Marseille was a great success: More than 550 participants from over 30 countries were happy to meet in person to discuss and exchange. The event was initially scheduled for the year 2021, but the Covid crisis altered our agenda, and the meeting had to be postponed to 2023. It was jointly organized together with our Italian (ADRITELF) and German friends (APV). This year, a novelty was introduced concerning the short talk sessions: The duration of the presentations was reduced to 10 min (including discussion). This modification was made because the number of requests for short talks exceeds the number of available slots by a factor of 7 to 8 at this conference series. Thus, the large majority of requests could not be satisfied in the past, and this not due to limited scientific quality, but for technical reasons only. The reduced length of the talks allowed us to double their number, which increased from 24 to 48. Overall, the feedback on this change was positive, and the speakers and chairpersons respected the time schedule well, which allowed the participants to switch between the parallel oral sessions.

Please join us at the *6th Symposium Skin and Formulation* on 2-3 October 2023 in Nantes! Specific emphasis will be placed on particularly hot topics in the field, including new formulation approaches. Overviews on the current state of the art will be provided and latest research findings be reported in the form of oral and poster presentations. In addition, an industrial exhibition will allow you to discuss with a range of companies offering high quality excipients, equipment and/or services.

And please do not forget the deadline for abstract submission (15th November 2023) for the upcoming *14th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology*, which will be held on 18 - 21 March 2024 in Vienna, Austria.

We are very much looking forward to meeting you again in person at these events!

Prof. Juergen Siepmann  
President of APGI

A handwritten signature in blue ink, appearing to read 'Juergen Siepmann', written in a cursive style.

# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

Following the success of the previous editions, We are now pleased to announce the upcoming

*"Skin and Formulation 6<sup>th</sup> Symposium"*  
on 2-3 October, 2023, in Nantes.

La Cité Nantes Congress Center



With more than 100 national and international destinations with direct flights, Nantes is the perfect city to live astonishing meetings between medieval sites, industrial heritage and imaginary worlds.

Topics will again focus on the areas that encompass pharmaceuticals, cosmetics and dermatology and about products applied to the skin. The main objective of this symposium is to compare, to confront point of views in order to initiate discussions and exchanges between the different communities composing the audience.



# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

The 6<sup>th</sup> Symposium programme will treat advances in topical formulations for improved skin delivery and will focus on solutions to today's economic, social and environmental challenges. Programme includes the following topics:



- **Skin pathologies and product needs.** Skin diseases and their complications are a significant burden worldwide, both in terms of acute and chronic morbidities and their related expenditures for care. Orphan skin pathologies or neglected tropical diseases of the skin require the development of new products which will be discussed during this symposium.

- **Preservation.** The drastic limitation of permitted preservatives over the years imposes to develop innovative strategies in terms of formulation, administration devices and/or packaging. One goal of the congress is to share solutions against this critical problem.



- **New directions in skin formulation.** Formulation of skin products is a constantly evolving field, particularly in response to regulatory changes. Besides the conventional aspects of stability or efficient delivery of active ingredients, controversial substances, microplastics or volatile compounds significantly change the formulation habits and the evaluation methods. This will be the common thread of the "Skin and Formulation 6<sup>th</sup> Symposium".

### Chairs of the conference

- Prof. Vincent Faivre, Paris-Saclay University
- Dr Anne-Marie Pensé-Lhéritier (HDR), President of FRMGalesens

### Programme Committee

- Dr Frédéric Bonté, Director of Scientific Communication, Guerlain
- Prof. Laurence Coiffard, Nantes University
- Prof. Vincent Faivre, Paris-Saclay University
- Prof. Nicolas Huang, Paris-Saclay University
- Dr Valérie Muguet, Project Manager, Galenic Formulation, Laboratoires Pierre Fabre, Division Medical Care

# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

MONDAY 2nd OCTOBER 2023

08:00 Registration and welcome coffee

09:00 Welcome introduction

	OPENING LECTURE		NEW DIRECTION IN SKIN FORMULATION
09:15	<b>Prof. Marc Brow, Medpharm—UK</b> Risk mitigation in Topical Product Development: Orthodoxy, Automation and Innovation	14:00	<b>Xavier Ormancey, Laboratoires Pierre Fabre—France</b> « Controversial » excipients: strategy on substitution depending on regulatory status
	<b>SKIN BIOLOGY AND PATHOLOGIES</b>	14:35	<b>Dr Laurianne Simon, University of Montpellier—France</b> Lypopolyoxazolines nanoformulations for improved skin delivery
10:00	<b>Prof. Laurent Misery, University of Brest—France</b> Sensitive skins: diagnosis and management	14:55	<b>Mathis Benyaya, PhD student, University of Lyon—France</b> Co-encapsulation of several actives in Pickering emulsions for topical delivery application
10:35	<b>Dr Ecaterina Gore, Normandie University—France</b> Tactyle Sensory Evaluation: an essential tool to evaluate skin-product interaction	15:15	<b>Hishda Mohamed, SEDERMA—France</b> Several carrier systems to increase the benefits of active substances
11:25	<b>Dr Georgios Stamatias, Johnson &amp; Johnson Santé Beauté—France</b> Recent advances in skin maturation during infancy and childhood	15:35	Posters session & exhibition Coffee break
12:00	<b>Dr Catarina Rosado, Universidade Lusofona—Portugal</b> Lipid-based nanocarriers based on insect biomass to tackle atopic dermatitis	16:15	<b>Prof. François-Xavier Legrand, Paris-Saclay University &amp; Prof. Emilie Munnier, University of Tours—France</b> Deep Eutectic solvents for skin formulation
12:20	<b>Simran Chaurasia, PhD Student, Maharaja Ranjit Singh Punjab Technical University—India</b> Design and Development of Nano-carrier Based Bilayer Therapeutic System for Ungual Drug Delive-	17:00	<b>Christoph Heuberger, Lipoïd—Switzerland</b> Effects of Phospholipids on Skin Retention and Penetration
12:40	Posters session & exhibition Lunch break	19:30	Gala reception in « Les Machines de l'Île »

# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

TUESDAY 3rd OCTOBER 2023

08:15 Door opening

	STRATEGIES OF FORMULATION		NEW DIRECTION IN SKIN DELIVERY: TECHNOLOGIES
08:45	<b>Dr Joana Marques Marto, University of Lisbon—Portugal</b> Waterless formulation in skin research	12:20	Posters session & exhibition Lunch break
09:20	<b>Dr Melanie Köllmer, RADES—Germany</b> Preservation of topical formulation: requirements and strategies	13:45	<b>Dr Morgan Dos Santos, LabSkin Creations—France</b> Advances and Innovations of 3D Bioprinting Skin for the Performance Evaluation of Cosmetic Products
09:55	<b>Prof. Guoping Lian, University of Surrey—UK</b> An end-to-end in-silica simulation workflow to understanding the formulation effect on percutaneous absorption	14:20	<b>Prof. Ryan Donnelly, Queen’s University Belfast—UK</b> Micro-needles and skin applications, new developments
10:15	Posters session & exhibition Coffee break	14:55	<b>Paraskevi Kyriaki Monou, PhD student, University of Thessaloniki—Greece</b> Fabrication of 3D printed coated micro-needles with electro-sprayed containing rivastigmine and N-acetyl cysteine nanoparticles for combined transdermal delivery
10:45	<b>Dr Pascale Gauthier, Auvergne University—France</b> Packaging as a full partner for protect formulations	15:15	<b>Dr Franciska Erdö, Pazmany Peter Catholic Univeristy—Hungary</b> Raman spectroscopy in skin research
11:20	<b>Lara Gorasek, Student, University of Ljubljana—Slovenia</b> Biomechanical properties of Sepigel with Flurbi-profen loaded Nanoparticles in vivo	15:50	<b>Lucas Chiarentin, PhD student, University of Coimbra—Portugal</b> Towards the development and optimization of a rheology method for a high viscosity cream: An Analytical Quality by Design (AQbD) approach
11:40	<b>Benjamin Gavinet, SEPPIC—France</b> Topical formulation of high concentration of cationic-form lidocaine hydrochloride with anionic rheology modifiers	16:10	<b>Dr Katy Margulis, The Hebrew University of Jerusalem, Israël</b> Mass-Spectrometry Imaging-Guided Design of Dermal Delivery Systems
12:00	<b>Yvonne Wiedemann, PhD student, University of Tuebingen—Germany</b> Poly(vinyl alcohol) Based Cryogel Patches as Drug Delivery Systems for Topical Application	16:30	Conclusion

# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

### EXHIBITION

Suppliers will again be invited to display their latest technologies. A live exhibition is the best way to interact with your current of future customers. We have reserved dedicated spaces in the Exhibition/Poster area for “equipped stand”. The exhibition will take place in the poster, coffee breaks and lunches area and will therefore provide you with a very good visibility.

If you want to become exhibitor, check our website: <https://apgi.org/agenda/skin-and-formulation-6th-symposium/>

or contact directly [apgi@apgi.org](mailto:apgi@apgi.org)





# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

### SPONSORING

Your support for the “Skin and Formulation, 6th Symposium” is important and will help us to make this conference a success and thereby continue to contribute of the development of the pharmaceutical and cosmetic sciences. We will put a range of sponsorship opportunities for this event.

If you want to sponsor our congress, chek our website: <https://apgi.org/agenda/skin-and-formulation-6th-symposium/>

or contact directly [apgi@apgi.org](mailto:apgi@apgi.org)

### OUR SPONSORS



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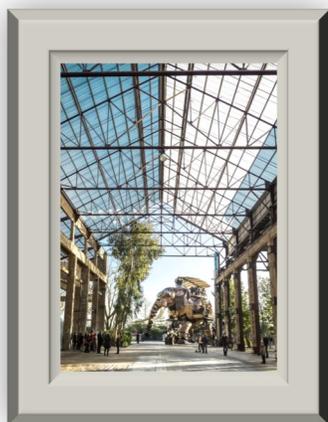
# International Conferences

## Skin and Formulation, 6<sup>th</sup> Symposium Current challenges in skin formulation 2-3 October 2023, Nantes

### REGISTRATION

Registration is open, directly on our website : <https://apgi.org/agenda/skin-and-formulation-6th-symposium/>

<b>INDUSTRIAL</b>		
	<b>APGI member</b>	<b>860 €</b>
	<b>Non APGI member</b>	<b>960 €</b>
<b>ACADEMIC</b>		
	<b>APGI member</b>	<b>455 €</b>
	<b>Non APGI member</b>	<b>555 €</b>
<b>STUDENT</b>		
	<b>APGI member</b>	<b>105 €</b>
	<b>Non APGI member</b>	<b>125 €</b>



Registration includes coffee and lunch breaks.  
It also includes the cocktail on Monday evening  
which will take place in the amazing place  
« Les machines de l'Île »

You will find on our website:

- Travel information and details for special rates with Air France
- A list of hotels with special rates
- And coming soon, information on shops, restaurants....

# Information Day

## Info Day “Poorly soluble drugs: An industrial perspective on formulations for bio-availability enhancement” 14 November 2023, Paris



Jointly organized with



During this one-day event, we will discuss

- Lipid Formulations
- Spray drying
- HME
- 3D Printing

With experts from industry and academia

- Prof. Eric Beyssac
- Dr. Jinhuk Rhaman Yildir
- Philippe Caisse
- Dipl.-Ing Dr. Martin Spoerk



# Information Day

## Info Day “Poorly soluble drugs: An industrial perspective on formulations for bio-availability enhancement” 14 November 2023, Paris

### PROGRAMME OF THE DAY

08:30 *Welcome coffe*  
09:00 *Partners & program presentation*  
09:20 ***Supplier view point client of lipid formulations***  
Philippe Caisse & Cécile Morin - Gattefossé  
10:00 ***Industrial view point client of lipid-formulations***  
Annabel Igonin - Nextpharma  
10:40 Coffee break  
11:10 ***In vitro testing challenges***  
Prof. Eric Beyssac - University Clermont Auvergne  
11:50 ***Tbc***  
Xavier Pepin - Simulation Plus

13:40 ***Spray Drying***  
Dr Cyril Lavaud - SANOFI  
14:20 ***HME***  
Andreas Gryczke - AbbVie  
15:00 ***Coffee break***  
15:30 ***Opportunities for 3D Printing to enhance availability***  
Dr. Jinhuk Rhaman Yildir, Nextpharma  
Philippe Caisse, Gattefossé  
16:10 ***Industrialization of lipid dosage forms***  
Dipl.-Ing Dr. Martin Spoerk, RCPE  
16:50 Closing remarks



# Hot Topic Day

## Info Day “Poorly soluble drugs: An industrial perspective on formulations for bio-availability enhancement” 14 November 2023, Paris

### FEES AND REGISTRATION

Free of charge for APGI members

For non members, fees are:

- students: 25 € + 20% french VAT
- academics: 90 € + 20% french VAT
- industrials: 220 € + 20% french VAT

And we this you become APGI member for 2024 (and you can assist free of charge to other Info Days in 2024 and have reduction to the PBP World Meeting in Vienna



### VENUE

Espace Van Gogh  
(Gare de Lyon)  
62 Quai de la Rapée  
75012 Paris



# International Conferences

## 14th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology 18-21 March 2024, Vienna



The 14th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology will be held in Vienna, Austria in 2024.

This conference has gained an ever increasing impact among the pharmaceutical scientists: With more than 1000 submitted abstracts and more than 1300 participants (before COVID crisis) it has become a well-established major meeting attracting scientists from all over the world. It is organized every two years, in March or April of the even years.

The entire spectrum of topics ranging from engineering aspects of the manufacturing process, the portfolio of commercially available excipients enabling formulation of a large variety of medicinal products, the underlying physico-chemical principles, cutting-edge characterization techniques as well as potential pitfalls and hurdles to be overcome during product development, manufacturing and characterisation will be addressed.



# International Conferences

## **14th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology 18-21 March 2024, Vienna**

The conference will be held on 3.5 days: from Monday (noon) until Thursday (evening). From Tuesday to Thursday, 4 parallel sessions with oral presentations will be held:

- 2 sessions on industry-related topics, presented by distinguished invited speakers, giving overviews on the current state of the art in the respective fields
- 2 sessions with short talks selected from submitted abstracts, presenting the latest research findings in the broad field of Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology.

During the entire conference, the accompanying exhibition ResearchPharm® provides a cross-disciplinary platform for pharmaceutical scientists working in all fields of drug development in industry, academia and regulatory bodies. This exhibition is steadily growing and offers the possibility to present and learn about the newest trends and products in the area of pharmaceutical ingredients, developing and processing equipment, analytical technologies, medicinal products, medical devices and contract manufacturing.

In addition, young and experienced scientists from academia and industry will present their latest research achievements in the form of poster presentations, allowing for fruitful scientific exchanges with the authors. The meeting is intended to bring together people working in fundamental and applied academic research, in the chemical and pharmaceutical industry and the regulatory field, offering the opportunity to initiate fruitful discussions and collaborations.

The organising committee cordially invites you to join the 14th World Meeting and would be glad to welcome you in Vienna, Austria!

# International Conferences

## 14th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology 18-21 March 2024, Vienna

### Monday 18 March 2024

13:00 – 13:45	Opening Ceremony	Exhibition
13:45 – 14:45	Key note lecture	
14:45 – 15:30	Coffee break	
15:30 – 17:30	Hot topic lectures	
17:30 – 19:00	Welcome Reception	

### Tuesday 19 March 2024

09:00 – 11:00	Invited talks	Short talks	Posters	Exhibition
11:00 – 11:30	Coffee break			
11:30 – 12:00	Award session			
12:00 – 13:00	Plenary lecture			
13:00 – 15:00	Lunch			
15:00 – 17:00	Invited talks	Short talks		
17:00 – 17:45	Students meets industry			

### Wednesday 20 March 2024

09:00 – 11:00	Invited talks	Short talks	Posters	Exhibition
11:00 – 11:30	Coffee break			
11:30 – 12:00	Award session			
12:00 – 13:00	Plenary lecture			
13:00 – 15:00	Lunch			
15:00 – 17:00	Invited talks	Short talks		
20:00 – 00:00	Gala dinner at the Hofburg			

### Thursday 21 March 2024

09:00 – 11:00	Invited talks	Short talks	Posters	Exhibition
11:00 – 11:30	Coffee break			
11:30 – 12:00	Award session			
12:00 – 13:00	Plenary lecture			
13:00 – 15:00	Lunch			
15:00 – 17:00	Invited talks	Short talks		

# International Conferences

## 14th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology 18-21 March 2024, Vienna

### SOCIAL PROGRAMME

#### WELCOME RECEPTION

The **Welcome Reception** will be held on **Monday, 18 March 2024** from 17:30 - 19:00 h. Enjoy a glass of wine while networking with old and new friends or strolling around the industrial exhibition ResearchPharm® and the poster session at the congress centre.



#### GALA DINNER

Join us for our unmissable social networking dinner at the historic event location "HOFBURG Vienna" (Michaelerkuppel, 1010 Wien, Austria) on **Wednesday, 20 March 2024 at 20:00 h.**

Experience Austria on a higher level and establish contacts in a relaxed atmosphere. Taste the variety of traditional austrian food.





# APGI Awards

## APGI Young Investigator Award 2024 Call for candidates

The “Young Investigator Award” recognizes the most outstanding doctoral thesis in the field of Pharmaceuticals, Biopharmaceutics and Pharmaceutical Technology every year.

If you defended your PhD thesis between 15 november 2022 and 14 october 2023, you can candidate for the 2024 “APGI YOUNG INVESTIGATOR AWARD”. Please send a pdf file of your thesis (in French or English) and a short curriculum vitae, by 30 October 2023, to APGI ([apgi@apgi.org](mailto:apgi@apgi.org)) and Géraldine Piel ([geraldine.piel@uliege.be](mailto:geraldine.piel@uliege.be)). The file can be sent by We Transfer (a compressed version would be appreciated).

The price (accompanied by a check) will be officially awarded at the 14th PBP World Meeting “Advanced technologies enabling new therapies” 18-21 March 2024 in Vienna, Austria.

Sponsored by



sanofi



# Retrospective

## 4th European Conference on Pharmaceutics 20-21 March 2023 held *in person* in Marseille



In 2015, the ADRITELF, APGI and APV started a new series of biannual, international scientific meetings in our field: The *European Conferences on Pharmaceutics*. The first congress was organized in Reims, followed by Krakow (2017) and Bologna (2019): Thus, the *European Conferences on Pharmaceutics* perfectly fill the gaps between the *World Meetings on Pharmaceutics*, *Biopharmaceutics* and *Pharmaceutical Technology*, which are held in all the even years (indicated in blue in the above scheme).

### European Conferences on Pharmaceutics



The 4<sup>th</sup> *European Conference on Pharmaceutics* was initially scheduled for the year 2021 in Marseille, but the Covid crisis altered the agenda, and the meeting had to be postponed to 2023.

**More than 550 participants from over 30 countries were happy to meet *in person* to discuss and exchange.** The organizing societies of the conference are convinced that *onsite* meetings with personal face-to-face contacts cannot be substituted by *online* meetings.



*In person* discussions are much richer than looking at each other on a screen. Also, many new contacts are made by “accident”, e.g. when lining up for a coffee or discussing a poster presentation. These occasions cannot be mimicked in a virtual conference.

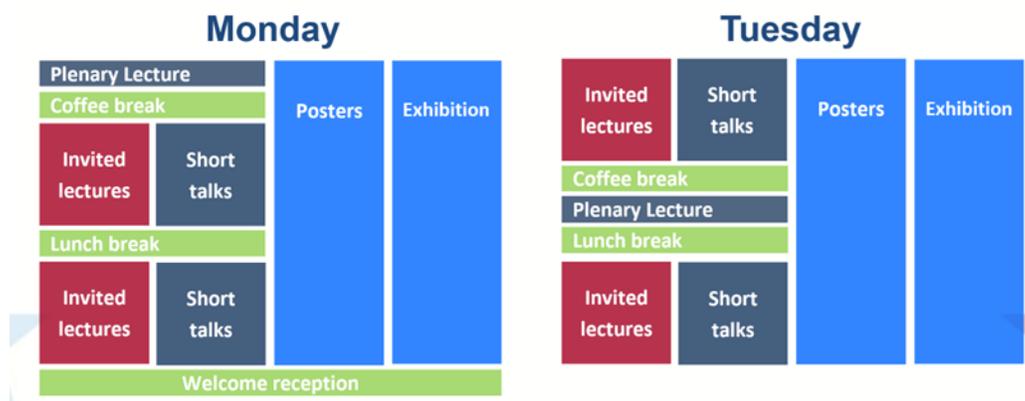


# Retrospective

## 4th European Conference on Pharmaceutics 20-21 March 2023 in Marseille

Please note that there are several differences between the *World Meetings on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology* and the *European Conferences on Pharmaceutics*: The latter are shorter, being held on 2 days (generally on a Monday & Tuesday). Two parallel sessions with oral presentations are offered:

- A session with **invited talks** (40 minutes), giving overviews on specific topics in our field
- A session with **short talks**, selected from submitted abstracts, reporting on most recent research findings.



The topics of these invited and short talk sessions were as follows:

- *Advanced drug delivery*
- *Advanced therapies*
- *Bioavailability*
- *Continuous manufacturing*
- *Controlled drug delivery*
- *Innovation in oral drug delivery*
- *In-silico simulations*
- *Nanoparticles and vesicles*
- *Nucleic acid delivery*
- *Oral delivery*
- *Personalized medicines*
- *Pharmaceutical manufacturing and engineering*
- *Technical innovations*
- *Topical and transdermal delivery*

# Retrospective

## 4th European Conference on Pharmaceutics 20-21 March 2023 in Marseille

This year, a **novelty was introduced for the short talk sessions**:

The duration of the presentations was reduced to **10 min** (including discussion and time for the speaker change). This modification was made because the number of requests for short talks generally exceeds the number of available slots by a factor of 7 to 8 at these conferences. Thus, the large majority of requests could not be satisfied and this not due to limited scientific quality, but for technical reasons only. The reduced length of the talks allowed us to double their number, which increased from 24 to 48. On the other hand, the speakers have to be more focused and have to come more rapidly to the key points of their presentations.

Overall, the feedback on this change was positive, and the speakers and chairpersons respected the time schedule well, which allowed the participants to switch between the parallel oral sessions.



Special highlights of the conference were the **plenary lectures** of:

Saso Jezernik, Takeda, Switzerland

*Digital health and treatments of the future*

Gert Storm, University of Utrecht, The Netherlands

*The role of liposomes in clinical nanomedicine development*

In addition, all day long the **industrial exhibition ResearchPharm®** offered the possibility to get into contact and exchange with companies offering laboratory equipment, excipients as well as scientific & technical services.

# Retrospective

## 4th European Conference on Pharmaceutics 20-21 March 2023 in Marseille

The industrial exhibition was held in the same area as the poster presentations, coffee & lunch breaks and welcome reception. This gave the opportunity to learn about newest research findings, initiate new contacts for future collaborations and to meet colleagues & friends. All breaks as well as the welcome reception were included in the registration fees.



Intentionally, **physical poster presentations** were organized all day long, and not electronic poster presentations on tiny screens during limited time periods. The latter do not allow to spontaneously walk through the poster sessions and have a look at the results or to get into contact with the poster presenters. Again, the organizers are convinced that *in person* meetings with multiple opportunities to interact are much more fruitful and intense than online exchanges.



The organizers are very grateful to the participants, speakers, poster presenters, exhibitors, chair persons and sponsors for their contributions to this conference.



# Retrospective

## APGI Young Investigator Award 2023

The “Young Investigator Award” recognizes the most outstanding doctoral thesis in the field of Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology every year.

This year, Dr Nevena PAUNOVIC—ETH Zurich received the Award during the 4th European Conference on Pharmaceutics., in Marseille.

Title of the thesis: « Development of Biomedical Inks for Light-Based 3D Printing of Biodegradable Non-Vascular Stents »

Supervisors: Prof. Dr. Jean-Christophe Leroux and Prof. Dr. André R.Studart

This award is very kindly sponsored by Sanofi.





# Retrospective

## APGI Young Investigator Award 2023

### Thesis Summary

3D printing in combination with medical imaging represents a powerful tool for the manufacturing of affordable patient-specific medical devices. Among the different 3D printing techniques, digital light processing (DLP) stands out due to its ability to rapidly produce high-resolution objects with smooth surfaces. However, the formulation of biomedical inks for DLP is challenging, which limits the scope of devices that can be fabricated by this technique. Therefore, novel DLP-compatible inks are sought-after to produce elastic, strong and biodegradable medical devices such as non-vascular stents.

This thesis describes several strategies to achieve this goal. The approaches for introducing therapeutic and shape-memory functions are also proposed. A library of polyester-based copolymers was synthesized and used to formulate inks, which were further proved suitable for DLP printing of medical devices, in particular airway stents.

The developed dual-polymer ink strategy proved successful in DLP printing of biodegradable elastomers with tuneable mechanical properties. It was accomplished by mixing high (*ca.* 15,000 g mol<sup>-1</sup>) and low (< 1000 g mol<sup>-1</sup>) molecular weight (MW) poly(D,L-lactide-*co*- $\epsilon$ -caprolactone) methacrylates in the same ink. High MW component provided cleavable groups and flexible chains required for degradability and elasticity, respectively. On the other hand, low MW photopolymer reduced viscosity of the inks, which is essential for high resolution printing. It also provided strength to the printed objects by increasing crosslinking density. The inks based on linear high MW and 4-arm low MW photopolymer enabled DLP printing of elastomers with mechanical properties comparable to those of silicone used for prototyping devices in biomedicine (Sylgard<sup>TM</sup>-184) with tailorable biodegradability as an additional asset. Another pair of photopolymers, comprising 4-arm high MW and linear low MW constituent, also allowed for printing of materials with tuneable elastomeric properties and biodegradability. Notably, the ink with 25 wt% of low MW photopolymer enabled to manufacture human-sized airway stents exhibiting an elasticity comparable to that of the state-of-the-art silicone stent. Besides the properties of photopolymers, the mechanical performance of a stent is determined by its radius and wall thickness. Simulations provided a guideline for selecting the thickness to achieve application-imposed stiffness of a stent with patient-specific radius. *In vivo* studies in healthy rabbits confirmed the biocompatibility of the DLP printed customized stents, and showed that the latter stayed in place for 7 weeks, after which they became radiographically invisible.

Besides biocompatibility, suitable mechanical properties and biodegradability, a therapeutic function is also a valuable asset to non-vascular stents. This thesis reports DLP printed composite material based on PEGylated gold nanorods (AuNRs) and 9000 g mol<sup>-1</sup> poly(D,L-lactide-*co*- $\epsilon$ -caprolactone) methacrylate with equimolar ratio of monomers that could be applied for photothermal therapy. The material demonstrated robust near infrared (NIR) light responsiveness, which allowed rapid and stable photothermal performance and led to the irradiation time-dependent cell death *in vitro*. Moreover, an increase in MW of photopolymer to 15,000 g mol<sup>-1</sup> and proportion of  $\epsilon$ -caprolactone to 90 mol% enabled the manufacturing of devices with shape-memory properties. AuNRs were further functionalized with a ligand having a composition similar to the photopolymer in order to prevent aggregation of the colloid within the ink. NIR light-triggerable shape transformation was illustrated by deploying a DLP printed stent *ex vivo*.

In addition to NIR light responsive devices, drug-eluting shape-memory stents based on 15,000 g mol<sup>-1</sup> poly(D,L-lactide-*co*-trimethylene carbonate) methacrylates that self-open at body temperature were also developed in this thesis. The stents prepared from 70–90 mol% D,L-lactide photopolymer recovered their functional shape at 37 °C in 1–3.5 min, respectively. Furthermore, the stents could release the model drugs levofloxacin (antibiotic) and nintedanib (antifibrotic agent) in a sustained fashion. The drug release kinetics could be tuned by varying the molar ratio of monomers in photopolymer's composition, exhibited by faster release of levofloxacin from the polymer network with higher content of D,L-lactide.

The results presented in this thesis provide the basis for the rapid and highly precise manufacturing of personalized multifunctional therapeutic devices displaying elasticity, degradability, shape-memory and therapeutic functions.

# Retrospective

## Interview of Nevena Paunovic



**Can you briefly summarize the main focus and key findings of your research?**

My thesis research focused on developing novel biomedical inks for light-based 3D printing of biodegradable non-vascular stents. Through interdisciplinary collaboration, we successfully created multiple inks for 3D printing of elastic biodegradable materials with diverse functionalities, such as drug elution, photothermal response and shape-memory. These materials open a new avenue for high-resolution 3D printing of personalized medical devices where biodegradability and elasticity play a pivotal role.

**Could you elaborate on the methodologies or techniques you employed during your research? How did these methods contribute to the advancement of Pharmaceutical Technology?**

My research encompassed a wide range of methodologies and techniques. These comprise polymer synthesis and all associated characterizations, followed by ink formulation and digital light 3D printing. Subsequently, I conducted extensive testing of materials, including mechanical testing, degradation studies and cytocompatibility tests. Additionally, I synthesized functionalized gold nanorods and characterized final NIR light-responsive materials and their photothermal effect. Furthermore, I demonstrated and evaluated the shape-memory properties of 3D printed materials when applicable. One of the important outcomes of my thesis is that it established a blueprint for systematic testing of biodegradable materials with various functionalities produced by light-based 3D printing, which could be used for manufacturing of personalized multifunctional medical devices.

**How do you envision your research findings benefiting the field of Pharmaceutical Technology? Do you have any plans to collaborate with industry professionals or other researchers to further develop or implement your work?**

The materials developed during my PhD have attracted attention from companies specialized in the manufacturing of medical devices. I hope that industry experts will be able to adapt and implement similar materials in an industrial setting, ultimately benefiting patients in need. After my PhD I decided to join another project in our lab where my colleague David Klein Cerrejon and I are leading a future spin-off from ETH Zurich – Transire Bio. With our small buccal patch called OctoPatch™, we aim to enable painless delivery of injectable drugs and offer millions of patients a chance to live without fear and pain.



# Retrospective

## Interview of Nevena Paunovic

**What motivated you to pursue research within the field of Pharmaceutical Technology? Were there any specific experiences or events that sparked your interest in this field?**

During my studies, I developed a strong interest in both Medicinal Chemistry and Pharmaceutical Technology. Choosing between the two fields was not an easy decision. However, the projects in Prof. Leroux's group, which focused on finding practical solutions to patients' problems, were truly captivating and led me to pursue a career in Pharmaceutical Technology. Additionally, I recognized that many large pharmaceutical companies lacked a strong emphasis on developing innovative dosage forms and implementing novel technologies. I saw an opportunity to make a difference in this area by becoming part of a multidisciplinary team, like the one in our group, that could fill this gap.

**Were there any significant challenges or obstacles you faced during your research journey? How did you overcome them?**

I encountered numerous challenges during my PhD journey, but I consider problem-solving to be one of the most valuable aspects of that experience. Overcoming these challenges required persistence, which became a mantra I often shared with new PhD students: 'Nothing works until we make it work.'

**In your opinion, what are the most promising areas for future research in Pharmaceutical Technology? Are there any specific areas that you believe hold great potential for innovation or impact?**

I believe that the future lies in personalized medicine, as well as in innovative dosage forms that can enhance drug stability, bioavailability and patient compliance, leading to better patient outcomes.

**Research often involves collaboration and mentorship. Can you tell us about any individuals or teams that played a crucial role in supporting your research journey?**

I was incredibly fortunate to have exceptional researchers as mentors and collaborators, whose guidance and support profoundly influenced my professional and personal growth. I must express my heartfelt appreciation to my thesis supervisor, Prof. Jean Christophe Leroux, whose contagious enthusiasm for science and emphasis on practical applicability inspired me to pursue a career in Pharmaceutical Technology. Dr. Yinyin Bao's passion for polymer chemistry enriched my PhD experience, and I am immensely grateful for his mentorship. Additionally, I owe a debt of gratitude to Prof. Zhi Luo, Prof. Kunal Masania, and Prof. Andre R. Studart for their invaluable scientific insights and their role in broadening my horizons. Throughout my research, I had the privilege of working with a multidisciplinary team, including engineers, material scientists, chemists, veterinary and medical doctors, and pathologists. Their diverse expertise and collaborative spirit made my PhD journey enjoyable and enriched the quality of my work.

# Retrospective

## Interview of Nevena Paunovic

**What advice would you give to PhD students interested in pursuing a career in the field of Pharmaceutical Technology, based on your own experiences?**

I would advise them to stay curious and embrace the opportunity to explore various interconnected fields, as pharmaceutical technology is deeply intertwined with many other disciplines. It's essential not to be afraid of stepping into unknown areas, as this can lead to exciting discoveries and open new perspectives. Remember that experiencing both ups and downs is a normal part of the PhD journey, but what truly matters is your determination to continue your research. Build connections with individuals who possess diverse expertise, as their support can be an invaluable asset to your PhD journey.



Retrospective

# Retrospective

## APGI Information Day

**“Innovative processes and formulations to answer current market trends in OSD forms”**

**20 June 2023 in Lyon**



Organized with



# Retrospective

## APGI Information Day

### “Innovative processes and formulations to answer current market trends in OSD forms” 20 June 2023 in Lyon

The day took place in the « Institut Lumière - Hangar du premier film » and the intensive programme was followed by 85 persons from academia and industry.

			
8:30-9:00	Welcome coffee	12:30-13:40	Lunch
9:00-9:20	Information on partners & programme	13:40-14:20	Compaction of sensitive Probiotics– Prosolv SMCC, Dr Susanne Florin-Muschert - University of Lille, Dr Gernot Warnke, Head of R&D - JRS
9:20-10:00	Challenges in oral application, new technologies and their opportunities, Dr Gernot Warnke, Head of R&D - JRS, Vanessa Bourdeaux - Skyepharma, Bruno Leclercq - Medelpharm	14:20-15:00	Introducing a Novel Formulation Approach for Poorly Water Soluble APIs, Dr Gernot Warnke, Head of R&D - JRS
10:00-10:40	General considerations in compression, Adrien Pelloux - Medelpharm	15:00-15:30	Coffee break
10:40-11:00	Coffee break	15:30-16:10	Challenges and innovation in TiO2 free coatings, Alireza Ramtin, Technical Sales Manager - JRS
11:10-11:50	Nanoencapsulation: a new era for oral solid dosage forms, Oksana Lemasson - LAGEPP	16:10-16:50	Using rheometry to accelerate your formulation development and control quality, Scott Hemphries, Technical Sales Manager - Caleva
11:50-12:10	Tab-in-tab: a versatile approach to address multiple unmet needs, Vanessa Bourdeaux - Skyepharma	16:50-17:00	Closing remarks
12:10-12:30	Soctec: an innovative gastro-retentive formulation, Pauline Tarlet - Skyepharma		



# Retrospective

## APGI Information Day

### “Innovative processes and formulations to answer current market trends in OSD forms”

20 June 2023 in Lyon



#### INTERVIEW

- What motivated you to organize this conference, and what do you hope to achieve through it?

The key elements for successful OSD development are expertise in formulation, processing technology and excipient functionality. The three companies organizing the event represent these three areas in an ideal manner.

- Could you provide an overview of the key topics or themes that were covered during the conference by the speaker's your company provided or supported?

Novel approach to formulation of poorly water-soluble APIs, Formulation options for pressure-sensitive APIs, TiO<sub>2</sub>-free alternatives in film coating.

- What were some of the outcomes or takeaways for attendees of these presentations during the information day?

Relevant and various topics, Good mix between new concepts and new excipients/equipments

- Are there any particular innovations or technological advancements that you believe will play a significant role in shaping the future of oral solid dosage forms?

With the growing number of poorly water-soluble APIs, environmentally friendly formulation techniques for the same will gain more and more interest. Another main area of growing importance is continuous manufacturing. Multi-functional excipients with good flow properties will help considerably to streamline continuous processes.

- How will the information day facilitate knowledge sharing and networking among industry professionals and researchers?

The lively Q&A sessions as well as the discussions during the coffee and lunch breaks clearly demonstrated the demand for networking events like this.

- What were the feedbacks that you received during/after the information day concerning the information day?

Great organization and place, the opportunity to learn more about many topics and especially about TiO<sub>2</sub> free coatings.

# Retrospective

## APGI Information Day

### “Innovative processes and formulations to answer current market trends in OSD forms”

20 June 2023 in Lyon



#### INTERVIEW

- What motivated you to organize this conference, and what do you hope to achieve through it?

Present innovation and technical knowledge to the market by meeting the industry face to face. Have informal discussions during breaks to feel current market challenges and needs.

- Could you provide an overview of the key topics or themes that were covered during the conference by the speaker's your company provided or supported?

General introduction on tableting and troubleshooting. First touch on the impact of ingredients / process parameters on the final product properties (tablets). We also invited Caleva to speak as their Caleva MultiLab (CML) technology is a good tool to understand wet granulation principles and assess critical process parameters.

- What were some of the outcomes or takeaways for attendees of these presentations during the information day?

Awareness of new technologies for development of tablets, even complex ones.  
Real examples and expertise shared by MEDELPHARM scientists for scientists

- Are there any particular innovations or technological advancements that you believe will play a significant role in shaping the future of oral solid dosage forms?

Compaction simulators become more and more used in the market. It is an essential tool for successful development of tablets of all kind. They respond to the need of understanding powder behavior under compression by providing accurate data with minimal quantities, even with High Potent API thanks to containment solutions.

# Retrospective

## APGI Information Day

### “Innovative processes and formulations to answer current market trends in OSD forms”

20 June 2023 in Lyon



#### INTERVIEW

- How will the information day facilitate knowledge sharing and networking among industry professionals and researchers?

Increase visibility, spread knowledge to the European Pharma Community  
Not only reserved for big pharma but for everybody from academia, CDMO, excipients, APIs, etc.

- What were the feedbacks that you received during/after the information day concerning the information day?

Great feedback. Maybe we should find a way to bring more dynamism between/during lectures (games, humor, etc.)  
The topics between the 3 different companies were quite broad. Having a more focused topic/approach for the next one would be recommended. And this needs to be thought before company selection and not after.

- Can you tell us more on the Workshop you organized prior to the information day?

Around 25 attendees from different part of the industry (academia, CDMO, big pharma, excipients) came to our facility to participate in 4 different workshops including various topics (wet granulation, DoE, press-coating, dry granulation, flowa-

# Agenda



## APGI events

- **Submission for APGI Young Investigator Award 2024**  
*Till 30 October 2023*
- **Skin & Formulation, 6th Symposium - Current challenges in skin formulation**  
*2- 3 October 2023, Nantes, France*
- **Info Day « Poorly soluble drugs: An industrial perspective on formulations for bio-availability enhancement »**  
*14 November 2023, Paris, France*
- **14th PBP World Meeting**  
*18-21 March 2024, Vienna, Austria*

# Miscellaneous

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