HyMedPoly

Deliverable D5.3

Outreach Activities – Status Report

Editor:	Stuart MacLachlan – Lucideon Limited
Deliverable nature:	Report (R)
Dissemination level: (Confidentiality)	Public (PU)
Contractual delivery date:	31 December 2016
Actual delivery date:	31 December 2016
Suggested readers:	Researchers and users of biomaterials; Commission services; MSCA programme project leaders
Version:	1.1
Total number of pages:	18
Keywords:	Marie Skłodowska Curie Programme, Workshops, Dissemination, Antimicrobial Materials

Abstract

The report describes HyMedPoly's outreach activities to publicise the science and technology of therapeutic biomaterials. Information is disseminated both from the project as a whole (Project Level Outreach) and through initiatives organised by the individual partners (Individual Level Outreach).

Open Scientific Workshops, the main vehicle for Project Level Outreach, have proved effective at attracting a wide audience to learn about the project and background science and technology. At the Individual Level the project beneficiaries are increasingly taking opportunities to publicise both the HyMedPoly project and the research results as projects progress.

Disclaimer

• *This report is classed as* **PU =** Public

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement n° 604251

Impressum

[Full project title]	Drug-Free Antibacterial Hybrid Biopolymers for Medical Applications
[Short project title]	HyMedPoly
[Number and title of work-package]	WP 5 Outreach
[Number and title of task]	Task 5.3 Events
[Document title]	Written Material for Project Dissemination
[Editor: Name, company]	Stuart MacLachlan, Lucideon Limited
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Executive Summary

HyMedPoly is developing new therapies based on intrinsically antibacterial materials and aims to ensure that whenever possible research results are disseminated widely to the scientific and business communities as well as the general public. Information is disseminated both from the project as a whole (Project Level Outreach) and through presentations and other initiatives organised by the individual partners (Individual Level Outreach).

Open Scientific Workshops have been the main vehicle for Project Level Outreach in the first two years of the HyMedPoly project. They are organised by the beneficiary hosting the event with support from the project coordinators with the objective of covering fundamental aspects of science, technology and clinical issues of antimicrobial biomaterials.

Two open workshops have been organised in the first two years of the project;

- "Biodegradable Polymers: Synthesis and Functionalisation" 10 February 2016.
- "Biomaterials in Medicine: New concepts of drug-free antibacterial therapies", 20 July 2016.

The workshops were well attended and popular with the delegates. Reports of the events have been posted on the HyMedPoly website and presentations can be downloaded.

The HyMedPoly project group members are proactively taking opportunities to publicise both the project and their research results as Individual Level Outreach.

Early in their engagement with the project, the ESRs were trained in communicating technical results to a wide audience and have subsequently had opportunities to present to internal project meetings to develop their skills.

As their projects progress, the ESRs are increasingly participating in outreach activities to disseminate their findings and publicise the MSCA programme at external technical meetings.

Entering the second period of the project the group is preparing its exploitation plans for HyMedPoly technology post project and will be carrying out further outreach activities both reporting the project outcomes and highlighting the benefits of using intrinsically antibacterial materials and products.

List of Authors

Company	Author	Contribution
Lucideon Limited	Stuart MacLachlan	Author
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1 Introduction to the HyMedPoly Project

Infection has become one of the toughest problems in the medical world and as bacteria become more resistant to drugs there are fewer effective antibiotics to fight against pathogens.

HyMedPoly is developing new therapies based on intrinsically antibacterial polymers, polymer composites with inorganic materials and polymers with antibacterial additives for the production of drug-free antibacterial hybrid biopolymers as therapeutic materials to prevent, control and remove infections.

Our ultimate goals are to develop a new generation of professionals who will play a pivotal role in pushing forward this challenging and knowledge-intensive field for the coming decades to benefit the European economy and who will be able to bring state-of-the-art technology to industry, advance products for hospitals and personal healthcare, and develop new and improved therapeutic strategies.

The HyMedPoly team has recruited a cohort of fifteen Early Stage Researchers (ESRs) to work with a group of nine universities and companies to:

- Validate the new materials concepts and determine key design parameters that will guide the development of families of novel therapeutic hybrid polymers to combat bacteria-related infection.

- Study industrial processing techniques to fabricate the medical materials and product demonstrators.

- Undertake a comprehensive and innovative training programme to meet industrial demands for fully rounded professional researchers.

Appendix 1 gives more details of the project group and the research projects supported.

2 HyMedPoly Outreach Activities – Status at 31/12/2016

Dissemination forms an integral part of the HyMedPoly Exploitation Plan, which has two distinct phases:

- Phase 1 (Months 1 – 24); Identify state-of-the-art antibacterial applications, key markets, and alternative applications. Disseminating HyMedPoly's aims and early activities.
- Phase 2 (Months 25 – 48): Prepare Exploitation Plans for HyMedPoly technology post project. These activities will include:
  - Brochures on medical polymers (including biodegradable) technology in antibacterial applications, their benefits and format of use for potential collaborators and end users.
  - Participation in workshops, targeted technical presentations and discussions with potential partners and customers.
  - Prototype demonstrations.
  - Dissemination to other sectors where the anti-bacterial materials technology could be applied.
  - Continue to monitor key markets and emerging innovations.

HyMedPoly is aiming is to ensure that whenever possible research results are disseminated widely to the scientific and business communities as well as the general public.

This information is disseminated both from the project as a whole (Project Level Outreach) and then through presentations and other initiatives organised by the individual partners (Individual Level Outreach). This report summarises the outreach activities carried out in the first project period and outlines future planned outreach.

2.1 Project Level Outreach

Open Scientific Workshops have been the main vehicle for project level outreach in the first two years of the HyMedPoly project.

The open workshops are organised by the beneficiary hosting the event with support from the project coordinators. The objective is to cover fundamental aspects of science, technology and clinical issues of antimicrobial biomaterials. Consequently the agendas aim to balance basic and applied research, provide a focus on practical requirements for the innovation and present a good overview of the scientific and technical status.

The workshops are publicised through flyers distributed locally by the organiser and through electronic media, particularly through the HyMedPoly website, www.hymedpoly.eu .

Two open scientific workshops had been organised in the first two years of the project in line with the Description of Action (DoA).

The first open workshop formed part of the scientific training of Summer School 1, which was intended originally for just the ESRs, but opened up to a wider audience.

“Biodegradable Polymers: Synthesis and Functionalisation” was held at Politecnico di Torino on 10 February 2016. The event, publicised through the flyer shown in Appendix 2, attracted 69 registered delegates. The majority were graduate and post graduate students from Politecnico di Torino, however delegates from local industry also attended.

Figure 1: The Open Workshop at Politecnico di Torino
Prof Ipsita Roy Lecturing

The half day programme comprised an introductory presentation on HyMedPoly and Politecnico di Torino followed by three presentations on different aspects of polymer science:

- *Introduction to HyMedPoly and Welcome to Politecnico di Torino*
  Gianluca Ciardelli, Politecnico di Torino (I)
  Flavio Canavero, Director of the Doctorate School Politecnico di Torino (I)

- *Chemical Synthesis of Biodegradable Polymers*
  Paola Petrini, Politecnico di Milano (I)
  A review of biodegradable polymers and the features affecting their properties, which focused on the chemical synthesis of biodegradable polyesters and polyurethanes.

- *Bacterial Synthesis of Polymers*
  Ipsita Roy, University of Westminster (UK)
  A review of Polyhydroxyalkanoates (PHAs), which are an emerging class of biodegradable and biocompatible polymers of natural origin with huge potential in biomedical applications. PHAs are currently being produced using Gram negative bacteria for potential use in hard and soft tissue

engineering, drug delivery, wound healing, stent and nerve conduit development.

- *Polymer Surface Functionalisation*
  Pietro Favia, Università di Bari (I)
  A review of the use of plasmas in life sciences, particularly surface modification plasma processes for biomaterials, highlighting applications through selected examples of plasma processing of scaffolds for Tissue Engineering, nano/bio composite PE-CVD coatings and free standing PE-CVD coatings "NanoFilms".

A report on the event was placed on the project website, which enabled download of the three scientific presentations.

The second open workshop, formally designated Workshop 1 in the DoA, covered "Biomaterials in Medicine: New concepts of drug-free antibacterial therapies". It was held as a full day meeting on 20 July 2016, organised and hosted by University of Westminster. The workshop was publicised through the flyer in Appendix 3 and attracted 34 delegates from the HyMedPoly project as well as postgraduate students and postdoctoral researchers from the London area.

Figure 2; The Open Workshop at University of Westminster
Prof John Haycock Lecturing

The workshop comprised five presentations from presenters, who are active workers in their fields. Three presentations were from project group members (PGM).

- *Biologically active ions in biomedicine, including antibacterial applications*
  Prof. Aldo Boccaccini, University of Erlangen-Nuremberg (D;PGM)-
  A review of the wide range of biologically active ions quoted in literature, highlighting the antibacterial activity.

- *Materials and Schwann cell approaches or repair to nerve injury*
  Prof. John Haycock, University of Sheffield (UK)
  An introduction to clinical strategies to repair gap injuries to peripheral nerves and the roles that materials and structures have in developing increased regeneration distances and in increasing the extent and effectiveness of reinnervation.

- *Antimicrobial Materials: A Clinician's Perspective*
  Dr. Jochen Salber, Knappschaftskrankenhaus Bochum (D;PGM)
  A review of microbe infections from a clinicians' perspective, highlighting the growing need for antimicrobial treatments to address an increasing number of both tissue and device related infections and focusing on the growth and proliferation cycles of bacteria and the challenges to producing effective treatments.

- *Exploiting glass formulations for antimicrobial applications*
  Ian Campbell, Lucideon Limited (UK;PGM)
  An introduction to the nature of glass, a key material type in HyMedPoly. The review covered glass preparation methods (fusion, phase separation and sol-gel processing), the effect of composition on properties and antimicrobial effect of certain glasses.

- *Tissue engineering challenges for cardiac repair*
  Prof. Sian Harding, Imperial College London (UK):
  A review of the role of materials in cardiac repair following heart failure, the challenges faced by researchers and some approaches under development. Case studies highlighted included the role of materials to enhance cell attachment or survival, engineered heart tissue and patches to deliver cells.

Again the workshop was reported on the project website with four of the presentations available for download.

The model for organising and presenting the open scientific workshops will be continued into the second period of the project as the workshops have proved popular the ESR cohort, the project partners and external delegates.

2.2 Individual Level Outreach

The HyMedPoly project group comprises seven beneficiary organisations with each ESR working with two of them; an academic host and an industrial or clinical host. Each beneficiary grouping is proactively taking opportunities to publicise both the HyMedPoly project and the research results as Individual Level Outreach.

Although at an early stage of their projects, the members of the ESR cohort are encouraged by their supervisors to present their work and to participate in outreach activities, which they are doing increasingly as they start to generate results. However in recognition of the importance of the ability to convey scientific knowledge and understanding to a wide range of stakeholders the ESRs have been trained in communication skills.

This training was given as part of the first Summer School in February 2016 through a module "Industry Training II - Best Practices in Managing Collaborative R&D Projects–Communication and Knowledge Management".

To consolidate their presentation skills, the ESR have to present their project results in a concise manner to the regular internal project reviews. For example each ESR gave a 10 minute PowerPoint presentation at the project Mid-Term Review summarising their personal profile, project objectives, project methodology, main results to date, training experience during HyMedPoly and expected impact of HyMedPoly on their Career.

As the projects progress, the ESRs are increasingly participating in outreach activities to disseminate their findings and publicise the MSCA programme. Before disclosing the information outside the project group, all presentations, articles and abstracts containing project results not in the public domain are circulated to each project beneficiary for approval to publish following the guidelines specified in the HyMedPoly Consortium Agreement. The approval process ensures that potentially valuable Intellectual Property is protected and not published prematurely.

Examples of outreach activities from the individual groups include:

- The four ESRs based at the University of Westminster were members of the organising committee of the 15th Annual meeting of the UK Society of Biomaterials (hosted by University of Westminster, 30th June- 1st July).

  They also presented posters during the conference (Isabel Orlando: "Drug free antibacterial hybrid biopolymers for medical applications", Sheila Piarali: "Antibacterial materials for biomedical applications" and Elena Marcello: "Hybrid gel composed of alginate and native vascular matrix") (Figure 3a).
- The UoW ESRs attended the 15th International Symposium on Biopolymers (Madrid, 26th -29th September) (Figure 3b). Isabel Orlando delivered a talk titled: "Drug free antibacterial hybrid biopolymers for medical applications" during the Session for Applications and commercialization of biopolymers and bio-based polymers: Materials for

medical and industrial uses. She introduced the HyMedPoly project and presented her results on chemical functionalization and antibacterial testing of bacterial cellulose. Her talk also featured preliminary results from Sheila Piarali and Elena Marcello's PhD project (Figure 3d). Alexandra Paxinou presented the poster: "Transfer of CVD-grown graphene on TiO2, Teflon and NiTi" (Figure 3c).

Figure 3 (Clockwise) a) Organising committee of UKSB conference b) Attendance at ISBP 2016 c) Alexandra Paxinou's poster presentation at ISBP 2016 d) Isabel Orlando's presentation at ISBP 2016

- Early results and project aims were disseminated by Prof. G. Ciardelli (Polito) by a talk (Subha Purkayastha, Patrícia Varela, Elia Ranzato, Susanna Sartori, Gianluca Ciardelli, "Novel polyurethanes mimicking antimicrobial peptides") held at a national congress (Congresso Biomateriali SIB 2016, Ischia Porto (Naples), 13 – 15 July 2016).
- Two ESRs based at FAU (Lukas Gritsch and Seray Kaya) attended the Summer School & International Workshop on Advanced Materials Challenges for Health and Alternative Energy Solutions (AMAES V) held from 31 August to 3 September at University of Cologne, Germany.

  A poster by Lukas Gritsch, FAU/Lucideon, "Fabrication of Chemically Modified Chitosan Films and Preliminary Characterization", was awarded for the 2nd best poster at the workshop.
- Seray Kaya (ESR at FAU) attended the 7th International Workshop on Advanced Ceramics (IWAC-07) in Limoges, France 26 - 28 September 2016. She presented the poster: "Processing and Characterization of Mesoporous Bioactive Silicate Glasses Doped with Biologically Active Ions".
- The ESRs based at Lucideon (Agata Łapa and Muhammad Maqbool) attended an undergraduate event at Queen Mary University, London in November 2016 to represent Lucideon/Erlangen/MSCA Scheme.

- Agata Łapa , FAU/Lucideon, presented to the 1-DRAC meeting (1 Day Research meetings in Advanced Ceramics) on her work “Influence of antimicrobial dopants on Phosphate Based Glasses for medical application” on 5 December 2016 at Kingston University, London.

3 Future Outreach Activities

As the project group enters Phase 2 (Months 25 – 48) and prepares its exploitation plans for HyMedPoly technology post project, it will be carrying out further outreach activities both reporting the project outcomes and highlighting the benefits of using intrinsically antibacterial materials and products.

At a project level, three further open workshops are planned in materials processing, clinical aspects of biomaterials and business planning for innovation. An international conference and school on drug-free antibacterial technology for medical applications is the project's final outreach activity.

At the individual partner level further outreach activities will report on research results and HyMedPoly in general, for example:

- The symposium "New advancements in drug-free antibacterial biomaterials for medical applications" proposed by POLITO has been accepted for presentation at TERMIS-EU 2017 26 - 30 June, 2017. Ayesha Idrees (POLITO/RUB) will be involved as co-chair and she is helping in the organization (together with Jem Vasquez (POLITO/Vornia) and Subha Purkayashta (POLITO/Vornia)) by sending invitations to potentially interested attendees.

- Several ESRs are aiming to present their work to the 28th Annual Conference of the European Society for Biomaterials (ESB), to be held in Athens 4 - 8 September 2017.

This proactive approach to outreach will enable HyMedPoly partners to disseminate the innovations from the project to a wide range of stakeholders and increase the likelihood of success of future exploitation of the technology through a more comprehensive understanding of user needs.

[End of Report]

Appendix 1 – The HyMedPoly Project Group and Research Projects

HyMedPoly aims to develop new therapies based on biomedical polymers and inorganic materials. The nine universities and companies from across Europe shown in Table 1 are creating a cohort of 15 European Industrial Doctorates. The projects, detailed in Table 2, are to synthesise new biopolymers with added antibacterial functionality and develop functionalised bioactive ceramics and glasses that can act as active agents to kill bacteria and prevent their growth.

The new material systems from HyMedPoly are aimed at applications such as wound care, implants and bio film prevention.

Table 1.1: The HyMedPoly Consortium Members

Consortium Member		Legal Entity Short Name
Beneficiaries		
1.	Lucideon	Lucid
2.	University of Westminster	UoW
3.	Politecnico di Torino	Polito
4.	University of Erlangen-Nuremberg	FAU
5.	Vornia	Vornia
6.	University of Southampton	Soton
7.	Knappschafts-Hospital Bochum GmbH	KHB
Partner Organisations		
8.	IK4 Tekniker	IK4
9.	Eurescom	EUR

Table 1.2: The HyMedPoly Research Projects

ESR	Project Title	Researcher	Academic Host	Non Academic Host
1	Degradable Antibacterial Polyesters and Composites	Jeddah Marie Vasquez	Polito	Vornia
2	Design and Engineering of Therapeutic Polyurethanes	Subha Purkayastha	Polito	Vornia
3	Bioresorbable Antibacterial Polyesters	Lukas Gritsch	FAU	Lucid
4	Biodegradable and Bioresorbable Polyesters	Binh Thi Thanh Phan	FAU	Lucid
5	Novel Antibacterial Natural Polymers	Elena Marcello	UoW	Vornia
6	Hydrogel Based Hybrid Antibacterial Polymers	Isabel Orlando	UoW	Vornia
7	Bioactive Silica Glass	Seray Kaya	FAU	Lucid
8	Substituted Hydroxyapatite	Muhammad Maqbool	FAU	Lucid
9	Bioactive Phosphate Glass	Agata Łapa	FAU	Lucid
10	Innovative Antibacterial Polymers	Alexandra Paxinou	UoW	KHB
11	Antibacterial Materials For Tissue Engineering Scaffolds	Sheila Piarali	UoW	KHB
12	Mechanobiology of Cell-Surface Interaction	Faezeh Shalchy	Soton	Lucid
13	Mechanics of Porous and Structured Materials	Loris Domincale	Soton	Lucid
14	In-vitro Bio-evaluation of Antibacterial Polymers	Ayesha Idrees	Polito	KHB
15	Antibacterial Testing of Polymers	Patricia Valera	Polito	KHB

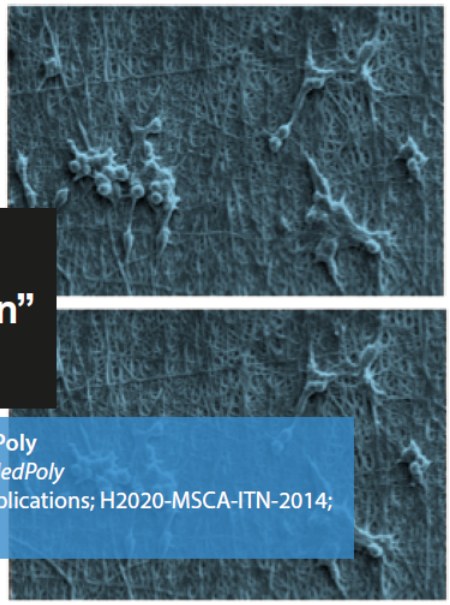
Appendix 2 – HyMedPoly Publicity Flyer for Summer School 1 Open Workshop, "Biodegradable Polymers: Synthesis and Functionalisation"

POLITECNICO DI TORINO

ScuDo
Scuola di Dottorato ~ Doctoral School
WHAT YOU ARE, TAKES YOU FAR

10 febbraio 2016 ore 9.00
Politecnico di Torino, C.so Castelfidardo
Sala Riunioni DET (5°piano)

February 10th, 2016 9.00 AM
Politecnico di Torino, C.so Castelfidardo
Meeting Room DET (5th floor)



"Biodegradable Polymers: Synthesis and Functionalisation"

Prof.Gianluca Ciardelli

Il Workshop è organizzato all'interno del progetto HyMedPoly
The workshop is organized in the framework of the project HyMedPoly
(Drug-Free Antibacterial Hybrid Biopolymers for Medical Applications; H2020-MSCA-ITN-2014; https://hymedpoly.eu/).

PROGRAMMA/PROGRAMME

9,00	Registrazione/*Registration*
9,20	Intervento di saluto **Prof. Flavio Canavero**, Direttore della Scuola di Dottorato (SCUDO) del Politecnico di Torino / *Welcome Address - Flavio Canavero, Director of the Doctoral School (SCUDO) at Politecnico di Torino*
9,30	**Prof. Gianluca Ciardelli**, Politecnico di Torino: Introduzione al Progetto HyMedPoly / *Introduction to HyMedPoly*
9,40	**Prof. Paola Petrini**, Politecnico di Milano: Sintesi di Polimeri Biodegradabili / *Chemical Synthesis of Biodegradable Polymers*
10,40	Coffee Break
11,00	**Prof. Ipsita Roy**, University of Westminster (UK): Sintesi Batterica di Polimeri / *Bacterial Synthesis of Polymers*
12,00	**Prof. Pietro Favia**, Università di Bari: Funzionalizzazione di Superfici Polimeriche / *Polymer Surface Functionalisation*
13,00	Conclusioni / *Conclusion*

Registrazione *Registration*

Il Workshop, in lingua inglese, è a numero chiuso e senza quota d'iscrizione. Per registrarsi è necessario compilare entro il 3 febbraio 2016 il modulo online al seguente link: https://hymedpoly.eu/open-workshop-science-2016
The participation to the workshop is free of charge, but a registration is required. To register, please fill in the online form before February 3rd, 2016 at: https://hymedpoly.eu/open-workshop-science-2016

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HyMedPoly received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 643050

Appendix 3 – Flyer for HyMedPoly Open Scientific Workshop 2 "Biomaterials in Medicine"

20th July 2016
University of Westminster
New Cavendish Street
115 Faculty of Science and Technology
Pavillion (1st floor),
New Cavendish Campus

Biomaterials in Medicine : New concepts of drug-free antibacterial therapies

Prof. Ipsita Roy

The meeting will explore the importance of antimicrobial approaches and cellular interactions in developing new concepts of drug-free antibacterial therapies.

Workshop programme

10:00 - 10:30	Coffee/Registration
10:30 - 11:30	Prof. Aldo Boccaccini (University of Erlangen-Nuremberg): *"Biologically active ions in biomedicine, including antibacterial applications"*
11:30 - 12:30	Prof. John Haycock (University of Sheffield): *"Materials and Schwann cell approaches or repair to nerve injury"*
12:30 - 13:30	Lunch
13:30 - 14:30	Dr. Jochen Salber: *"Antimicrobial Materials: A Clinician's Perspective"*
14:30 - 15:30	Ian Campbell (Lucideon): *"Exploiting glass formulations for antimicrobial applications"*
15:30 - 16:00	Coffee/Tea break
16:00 - 17:00	Prof. Sian Harding (Imperial College London): *"Tissue engineering challenges for cardiac repair"*
17:00 – 17:05	Concluding remarks – Prof. Ipsita Roy (University of Westminster)

Registration: https://hymedpoly.eu/open-workshop-science-2016/

The workshop is part of the HyMedPoly project (*Drug-free antibacterial hybrid biopolymers for medical applications;* H2020-MSCA-ITN-2014; https://hymedpoly.eu/).

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HyMedPoly received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie Grant Agreement No 64305

