



*7<sup>th</sup> World Conference on*

# Trgeting Phage Therapy

June 20-21, 2024 - Malta



## Agenda

**PHAGE**  
THERAPY 2024



INTERNATIONAL SOCIETY OF  
**ICROBIOTA**

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# Targeting Phage Therapy

**PHAGE**  
THERAPY 2024

**June 20-21, 2024**  
Corinthia Palace, Malta

**Call for Abstracts**
**Short oral: June 4**
**Poster: June 6**
**Early Bird Registration**
**May 13, 2024**
**Keynote speech**

**Clinical Trials in Phage Therapeutics: Looking Under the Hood**
**Robert T. Schooley**

University of California, San Diego, USA


**Phage Therapy: A Glimpse Into Clinical Studies Involving Over 150 Cases**
**Nannan Wu,**  
Shanghai Public Health Clinical Center, Fudan University, China

**Regulatory restrictions vs. Human Rights, the Hippocratic oath and the Freedom of therapy: The legal aspect of phage therapy**
**Barbara Brenner,**  
Kanzlei BRENNER, Germany

**Mycobacteriophages and Their Therapeutic Potential**
**Graham F. Hatfull,**  
University of Pittsburgh, USA

**Phage therapy: Targeting Intestinal Bacterial Microbiota for the Treatment of Liver Disease**
**Jumpei Fujiki,**  
University of California San Diego, USA  
Rakuno Gakuen University, Japan

**Addressing Phage Resistance to Enhance the Robustness of Phage Therapy for Pseudomonas aeruginosa Infections in People with Cystic Fibrosis**
**Federica Brianti,**  
University of Milan, Italy

**The Phageome in Normal and Inflamed Human Skin**
**Wolfgang Weninger,**  
Medical University of Vienna, Austria

**Phage Satellites, a Diversity of Extradimensional Symbionts and Pathways to Phage Therapy**
**Rodrigo Ibarra Chávez,**  
University of Copenhagen, Denmark

**The Untapped Potential of Phage Model Systems as Therapeutic Agents**
**Frederic Bertels,**  
University of Copenhagen, Denmark

**Cell-Free Production of Personalized Therapeutic Phages Targeting Multidrug-Resistant Bacteria**
**Killian Voegelé,**  
Invitris, Germany

**Making Antibiotics Great Again: Phage resistance in vivo correlates to re-sensitivity to antibiotics in pan-resistant Pseudomonas aeruginosa**
**Sabrina Green,**  
KU Leuven, Belgium

**Magistral Phage Preparations: Is This the Model for Everyone?**
**Jean-Paul Pirnay**  
Queen Astrid Military Hospital, Belgium

**Developing Phage Therapy Through an Evolutionary-Medicine Lens**
**Paul Turner,**  
Yale University, USA

**Genetic Engineering of Phages to Target Intracellular Bloodstream E.coli Infections**
**Antonia P. Sagona,**  
University of Warwick, United Kingdom

**Towards Efficient Phage Therapies: Investigation of Phage / Bacteria Equilibrium with Metagenome of Dark Matter in Natural Samples**
**Domenico Frezza,**  
University of Roma Tor Vergata, Italy

**Evolution and Megataxonomy of Viruses: The Place of Phages in the virosphere**
**Eugene V Koonin,**  
National Institutes of Health, USA

**Adaptive Phage Therapy In The Intensive Care Unit: From Science to Patients**
**Ekaterina Chernetskaya,**  
Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitation, Russia

**Quality control of phage Active Pharmaceutical Ingredients (APIs) in Belgium**
**Pieter-Jan Ceyssens,**  
Sciensano, Belgium

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## Program of Targeting Phage Therapy 2024

Day 1 - June 20, 2024

- 8h00 Welcoming of attendees & Badge Distribution
- 8h50 Welcome Note of Targeting Phage Therapy 2024
- 9h00 Keynote Speech



### **Clinical Trials in Phage Therapeutics: Looking Under the Hood**

**Robert T. Schooley**, University of California, San Diego, USA

#### **Key Points:**

- Clinical trials of phage therapeutics are accelerating.
- Rigorous translational research tools must be integrated into study design.
- Trials should go beyond simple clinical endpoints.
- The aim is to contribute directly to understanding fundamental principles of phage therapy.
- Systematic elucidation of these principles will hasten phage therapy's advancement into clinical medicine.
- Provides a framework for objectively evaluating new phage-based therapeutic approaches transitioning from bench to bedside

## **Session 1 – Phages, Hosts & Microbiome: On the Way to Medical Revolution**



### **9h45 Evolution and megataxonomy of viruses: the place of phages in the virosphere**

**Eugene V Koonin**, National Institutes of Health, USA

#### **Key Points:**

- Describe the large-scale evolutionary relationships within the virosphere as informed, in particular, by recent, extensive metagenome and metatranscriptome analyses.
- Show how these relationships are encapsulated in the comprehensive virus taxonomy currently adopted by the International Committee on Taxonomy of viruses and what major changes to that taxonomy appear justified.
- Emphasize the multiple origins of bacteriophages, their expanding diversity and the relationships with viruses of eukaryotes.



### **10h10 The Phageome in Normal and Inflamed Human Skin**

**Wolfgang Weninger**, Medical University of Vienna, Austria

#### **Key Points:**

- Overview of Atopic Dermatitis (AD) as an inflammatory skin disease with dysbiosis of the skin microbiota.
- Utilization of machine learning algorithms to define viruses, including bacteriophages, in patient samples.
- Identification of unique phages under homeostatic and inflammatory conditions.
- Current efforts focused on characterizing phages isolated from patients for their potential to modify the skin microbiome.

### **10h35 – Panel Discussion**

10h45 **Coffee Break, Networking, Poster & Exhibition Sessions**



11h25 **Phage therapy: Targeting intestinal bacterial microbiota for the treatment of Liver disease**  
**Jumpei Fujiki**, *University of California San Diego, USA / Rakuno Gakuen University, Japan*

**Key Points:**

- Phages have precise editing capabilities on the gut microbiota.
- Cytolytic *E. faecalis* plays a role in alcohol-associated liver diseases, contributing to disease progression. Targeting this pathogen offers a potential treatment avenue for liver disease.
- Analysis conducted on phage-resistant variants of cytolytic *E. faecalis*
- Evolution of Enterococcus phages also examined in the study.



11h50 **Towards efficient phage therapies: investigation of phage / bacteria equilibrium with metagenome of dark matter in natural samples**

**Domenico Frezza**, *University of Roma Tor Vergata, Italy*

12h10 – Panel Discussion

12h30 **Lunch Break, Networking, Poster & Exhibition Sessions**

## Session 2 - Phage Therapy: Emerging Trends and Innovative Approaches



14h00 **Mycobacteriophages and Their Therapeutic Potential**  
**Graham F. Hatfull**, *University of Pittsburgh, USA*

**Key Points:**

- Genetic diversity of Mycobacteriophages
- Therapeutic usage of phages for treating NTM infections
- Limitations to broader use of phages for treating NTM infections.



14h25 **Improving Phages Through Experimental Evolution**  
**Frederic Bertels**, *Max Planck Institute for Evolutionary Biology, Germany*

**Key Points:**

- Overview of lab projects focusing on experimental evolution approaches to study phages.
- Experimental evolution enables:
  1. Modification of host ranges of phages.
  2. Examination of how antibiotics impact resistance evolution.
  3. Alteration of phage life history traits.
- Experimental evolution serves as the primary tool for developing PhiX174, a model phage, into a therapeutic agent.



14h50 **Addressing Phage Resistance to Enhance the Robustness of Phage Therapy for *Pseudomonas aeruginosa* Infections in People with Cystic Fibrosis**  
**Federica Briani**, *University of Milan, Italy*

**Key Points:**

- *P. aeruginosa* clinical strains isolated from people with Cystic fibrosis are highly heterogenous and very frequently multi-resistant to phages. Resistance to phages is also developed in susceptible strains.
- Natural *Pseudomonas* phages tend to use a relatively small repertoire of receptors among which pili and LPS, which are typically modified/lost by clinical strains.
- Approaches to address this challenge that we are exploring in the lab will be presented.

15h15 – Panel Discussion

15h30 **Coffee Break, Networking, Poster & Exhibition Sessions**



16h10 **Genetic Engineering of Phages to Target Intracellular Bloodstream *E.coli* Infections**

**Antonia P. Sagona**, *University of Warwick, United Kingdom*

**Key Points:**

- Discuss methodology developed in the lab for genetically modifying *E.coli* bacteriophages.
- Focus on increasing tropism towards human cells and enhancing ability to target intracellular bacteria.
- Present unpublished data on novel phages isolated and characterized, targeting clinical bloodstream *E.coli* from UCWH hospital patients' samples.
- Aim to genetically modify these novel phages to invade human cells more efficiently and clear intracellular bloodstream infections. Objective includes identifying optimal cellular conditions for phage therapy.
- Highlight example of proof of concept in vitro work, demonstrating applied phage therapy targeting clinical samples from patients.



16h35 **Cell-Free Production of Personalized Therapeutic Phages Targeting Multidrug-Resistant Bacteria**

**Kilian Voegelé**, *Invitris, Germany*



17h00 **Phage Satellites, a Diversity of Extradimensional Symbionts and Pathways to Phage Therapy**

**Rodrigo Ibarra Chavez**, *University of Copenhagen, Denmark*

**Key Points:**

- Phage Satellites
- Phage Delivery
- Anti-phage
- Transduction
- Symbionts

17h25 – Panel Discussion

17h40 – Short Oral Presentations & Innovations: 10 Minutes Pitch for Industries (5 slots)

18h30 – End of Conference Day 1

20h00 – Speakers' Dinner (reserved for ticket holders)

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## Program of Targeting Phage Therapy 2024

Day 2 - June 21, 2024

8h50 Welcoming of attendees & Badge Distribution

### Session 3 - Phages Therapy 2024: From Bench to Bedside



9h00 **Leveraging Evolutionary Trade-Offs in Development of Phage Therapy**  
**Paul Turner**, Yale University, USA

#### **Key Points:**

- Explore concerns regarding evolved phage resistance and its implications in clinical settings.
- Discover how precise phage selection pressure can positively influence outcomes amidst resistance challenges.
- Show results from both laboratory experiments and in vivo studies.
- Emphasize the significance of understanding the interactions between phage therapy and human immunology for improved clinical efficacy.



9h25 **Adaptive Phage Therapy in The Intensive Care Unit: From Science to Patients**  
**Ekaterina Chervenskaya**, Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitology, Russia

#### **Key Points:**

- Adaptive phage therapy selects bacteriophages for the entire spectrum of bacteria in the ICU.
- Continuous clinical and microbiological monitoring ensures efficacy.
- Results indicate potential for reducing antibiotic usage and preserving efficacy.
- Adaptive phage therapy protocol demonstrates promise in ICU settings.



9h50 **Phage Therapy: A Glimpse into Clinical Studies Involving Over 150 Cases**  
**Nannan Wu**, Shanghai Public Health Clinical Center, Fudan University, China

#### **Key Points:**

- Brief overview of the history and current status of phage therapy in China
- Statistical analysis of the preliminary data from their team's 150 personalized phage therapy cases
- Discussion of specific observations and insights gained from case studies.
- Exploration of future opportunities and challenges for the advancement of phage therapy in China.

10h15 – Panel Discussion

10h30 **Coffee Break, Networking, Poster & Exhibition Sessions**



11h10 **Making Antibiotics Great Again: Phage resistance in vivo correlates to resensitization to antibiotics in pan-resistant *Pseudomonas aeruginosa***  
**Sabrina Green**, KU Leuven, Belgium

#### **Key Points:**

- Overview of phage and antibiotic synergy in general.
- Detailed examination of data specific to the recent 100 patient case



11h35 **Quality control of phage Active Pharmaceutical Ingredients (APIs) in Belgium**

**Pieter-Jan Ceyssens**, *Sciensano, Belgium*

**Key Points:**

- Sciensano 5 years of experience with quality control of phage therapeutics
- Focus on genetic variability and the reoccurring problem of prophage contamination, especially when using clinical strains in phage production.

**12h00 – Panel Discussion**

**12h10 – Short Oral Presentations & Innovations (3 slots)**

**Bacteriophage Genome Annotation: Comparing Automatic and Manual Approaches**

*Antoine Culot, Rime Bioinformatics, France*

**Bacteriophage Host Ranges: A Key to the Two Therapy Strategies**

*Ivan M. Pchelin, Institute of Experimental Medicine, Russia*

12h40 **Lunch Break, Poster & Exhibition Sessions**

**Session 4 - Ethical Considerations and Regulatory Landscape of Phage Therapy:  
Challenges, Advocacy and Task Forces**



14h00 **Regulatory restrictions vs. Human Rights, the Hippocratic oath and the Freedom of therapy– The legal aspect of phage therapy**

**Barbara Brenner**, *Kanzlei BRENNER, Germany*

**Key Points:**

- Anecdotal evidence vs. RCTs (is it ethical to perform RCTs if enough evidence can be drawn from microbio science + case reports?)
- Regulatory issues on magistral preparations (non-GMP, adaptive GMP or Brussels monograph)
- Human right to quick and affordable access to phage drugs: is safety really an issue with phage preps (risk assessment)?
- Art. 37 of the Helsinki Protocol of WMA & the Hippocratic oath vs. Regulators: Are regulators entitled to forbid non-GMP phages be produced and taken to cure emergencies given the fact that GMP-phages still aren't available (or - in future - cannot be afforded)? Or does the "all you can grab"-guideline prevail?
- Fighting back the AMR-tsunami: which strategy have the countries got (if at all!)? Will industrial phages help us out? One Health approach, animal farming, restriction of chemical antibiotics to emergencies, promote phages as basic interventions and go in with chemical antibiotics only if phages won't work (model: Georgia)



14h25 **Magistral Phage Preparations: Is This the Model for Everyone?**

**Jean-Paul Pirnay**, *Queen Astrid Military Hospital, Belgium*

14h50 – Panel Discussion

15h00 – Short Oral Presentations & Innovations (3 slots)

15h30 **Coffee Break, Networking, Poster & Exhibition Sessions**

16h15 – Short Oral Presentations & Innovations: 10 Minutes Pitch for Industries (4 slots)

16h55 – Discussion & Concluding Remarks

17h15 – Awards of Targeting Phage Therapy 2024

17h30 – End of Targeting Phage Therapy 2024



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