

## Bacteriophage therapy in BJI: Fact or fiction? From mythology to clinical evidence

Tristan Ferry, MD, PhD

*tristan.ferry@univ-lyon1.fr*

 @FerryLyon 

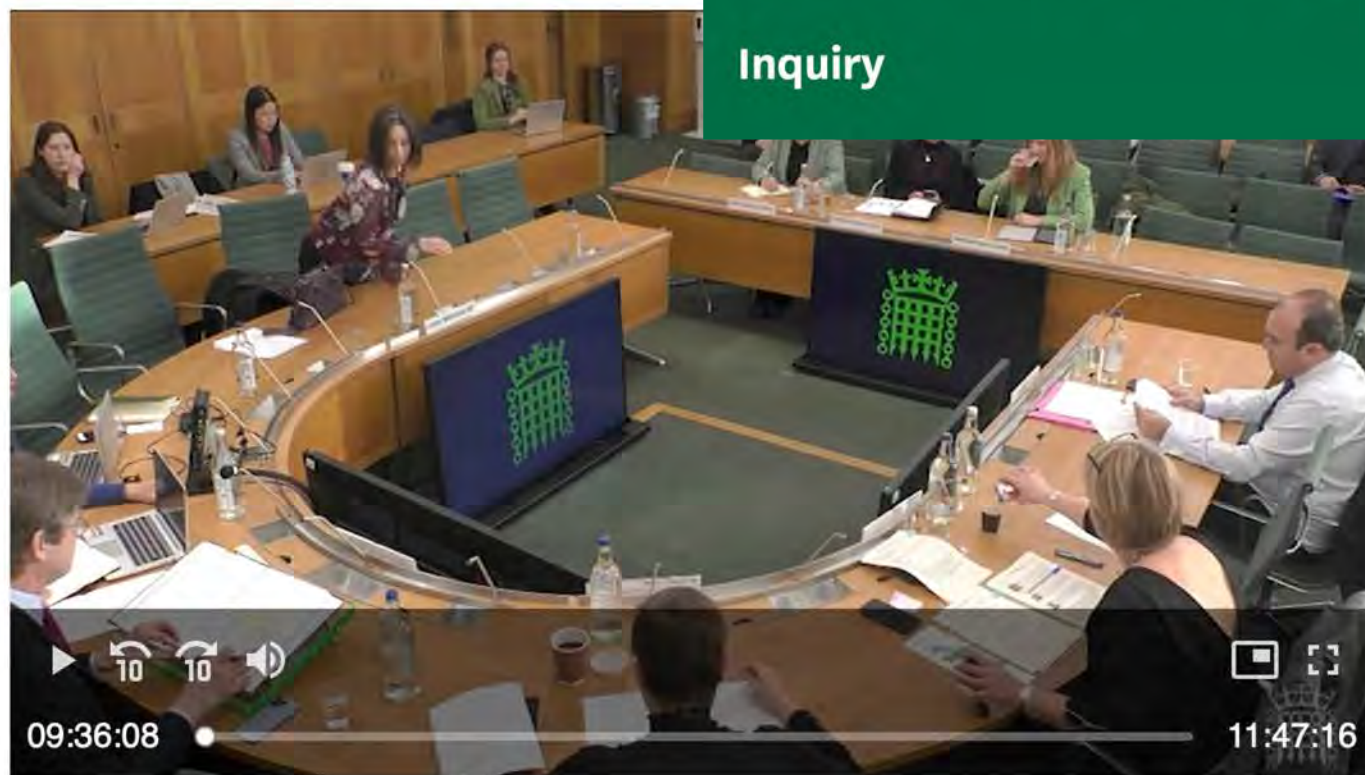
Infectious and Tropical Diseases Unit, Croix-Rousse Hospital , Hospices Civils de Lyon, Claude Bernard Lyon1 University, Lyon  
Centre International de Recherche en Infectiologie, CIRI, Inserm U1111, CNRS UMR5308, ENS de Lyon, UCBL1, Lyon, France  
Clinical officer ESCMID Study group for Non-Traditional Antibacterial therapy (ESGNTA)  
Referral center for the management of complex bone and joint infections (CRIOAc Lyon)



Science and Technology Committee  
Wednesday 8 February 2023 Meeting

# The antimicrobial potential of bacteriophages

## Inquiry





09:34:35 Subject: The antimicrobial potential of bacteriophages

09:34:36 Witness(es): Professor Martha Clokie, Professor of Microbiology, University of Leicester; Professor Cath Rees, Professor of Microbiology, University of Nottingham; Professor Joanne M. Santini, Professor of Microbiology, University College London

10:21:03 Witness(es): Dr James Soothill, Consultant Microbiologist, Great Ormond Street Hospital Laboratory Medicine; Dr Josh Jones, Clinical Phage Specialist, NHS Tayside

11:06:44 Witness(es): Ms Stephanie Lesage, Co-Founder/Director and Chief Executive Officer, Oxford Silk Phage Technologies Ltd; Mr David Browning, Chief Executive Officer, Fixed Phage LTD

SHARE DOWNLOAD INFO AUDIO ONLY 

# Phage-UK

[www.phageuk.com](http://www.phageuk.com)

Non-profit, **network of 50+ UK clinicians and scientists**, in 15 Trusts

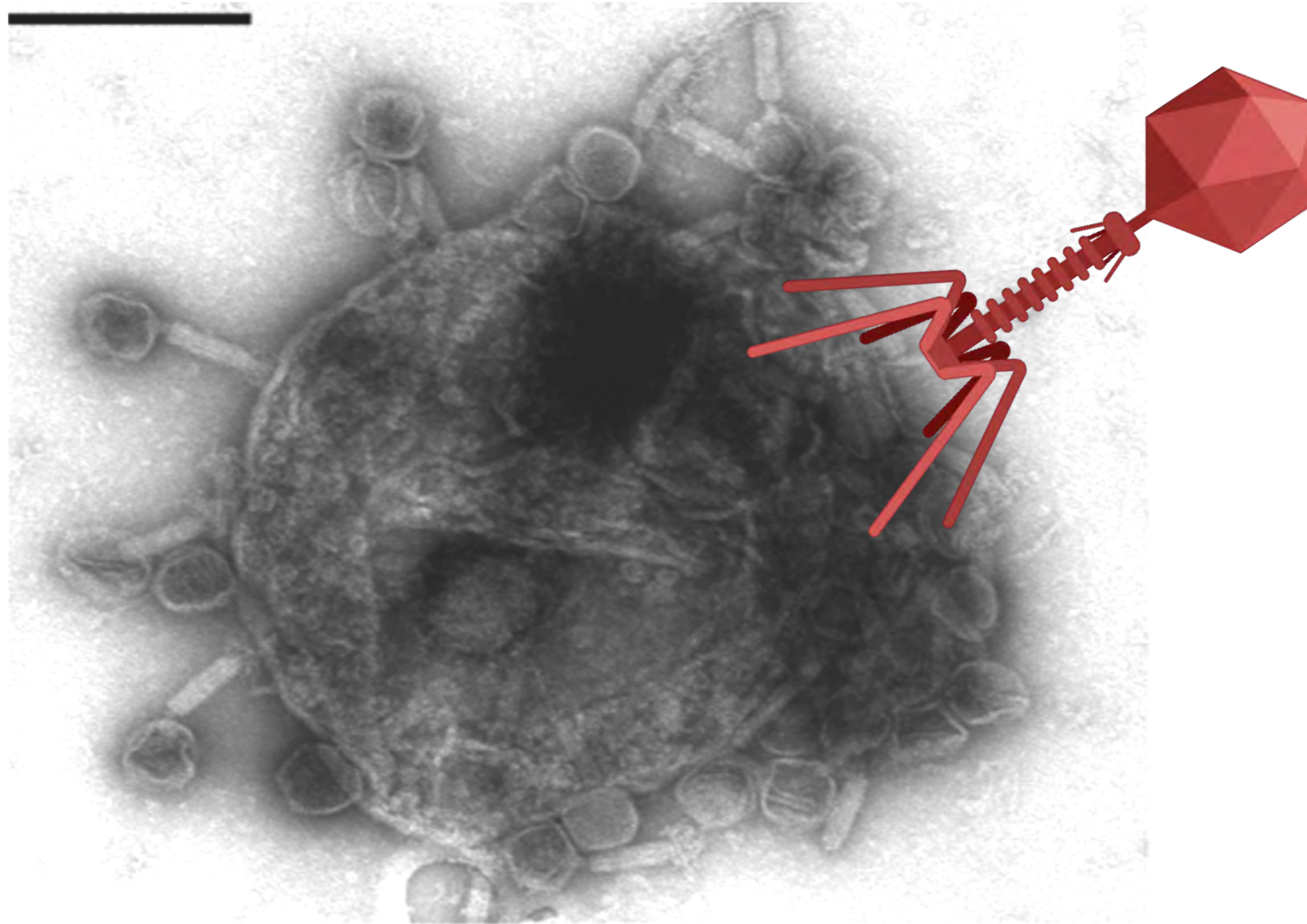
## GOALS

- Help establish a standardised way forward for the wider use of phage therapy on a named-patient basis, to provide for patients whose infections no longer respond to antibiotics.
- Connect clinicians to the right research groups, companies and institutes to facilitate the logistics of phage therapy administration.
- Centralise expertise and data gained from the network, to help design clinical trials which will lead to the use of phages as a licensed medicine, helping patients long before they run out of treatment options.
- Inform patients on phage therapy and their options for access to phages.



[info@phageuk.com](mailto:info@phageuk.com)

# Bacteria have also their pandemics!



Merabishvili et al. *PLoS ONE* 2009

# Bacteriophage Distributions and Temporal Variability in the Ocean's Interior



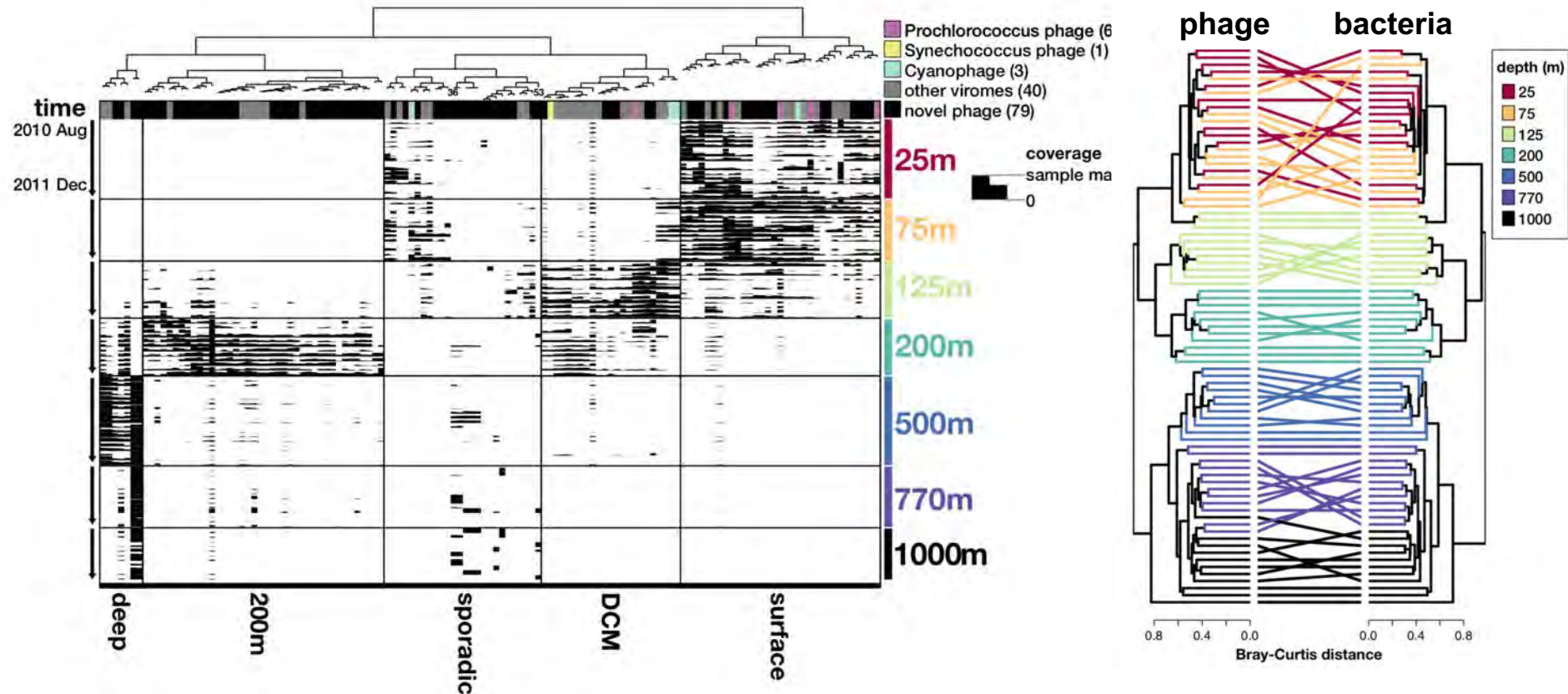
AMERICAN  
SOCIETY FOR  
MICROBIOLOGY

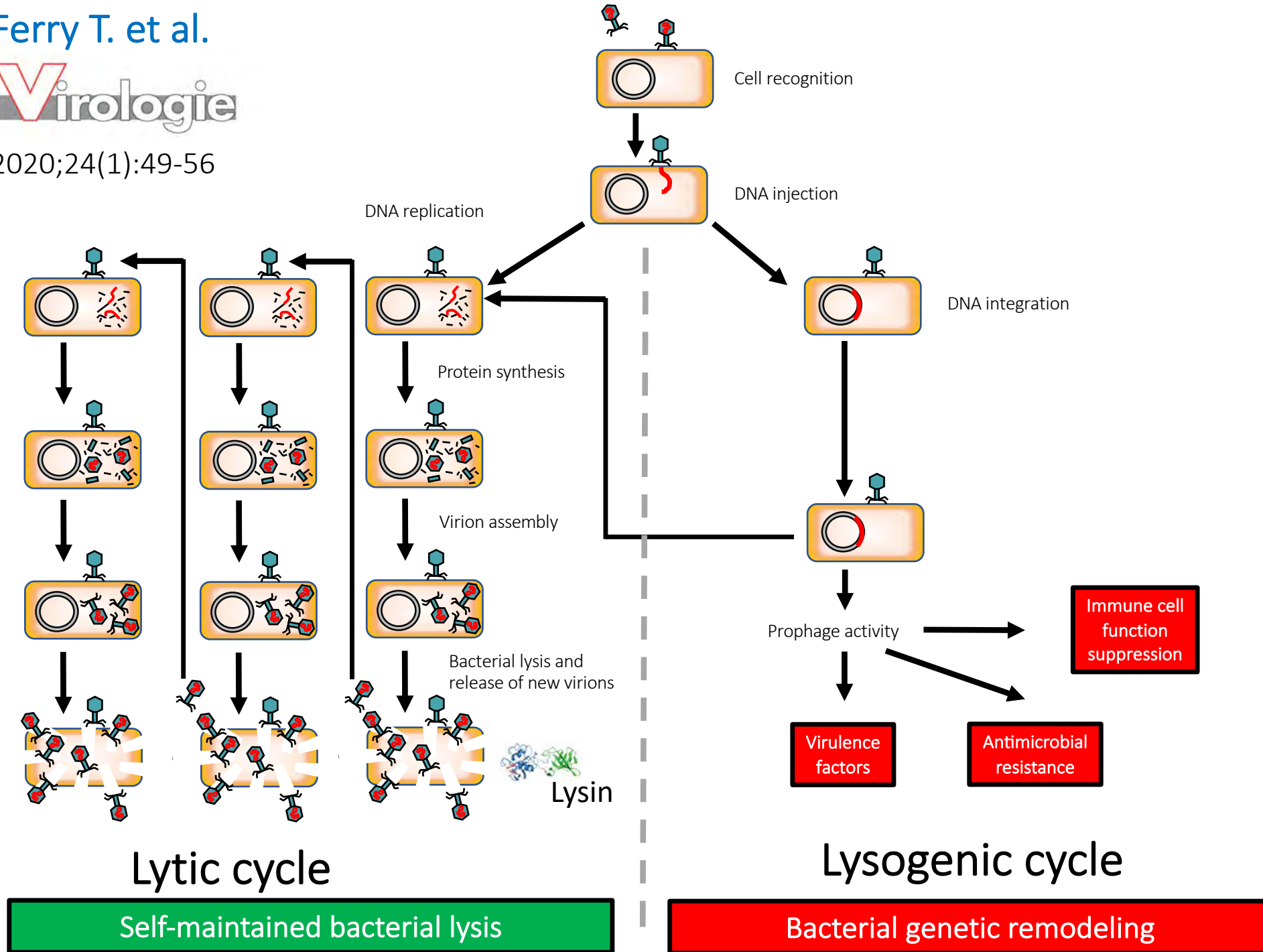


2017

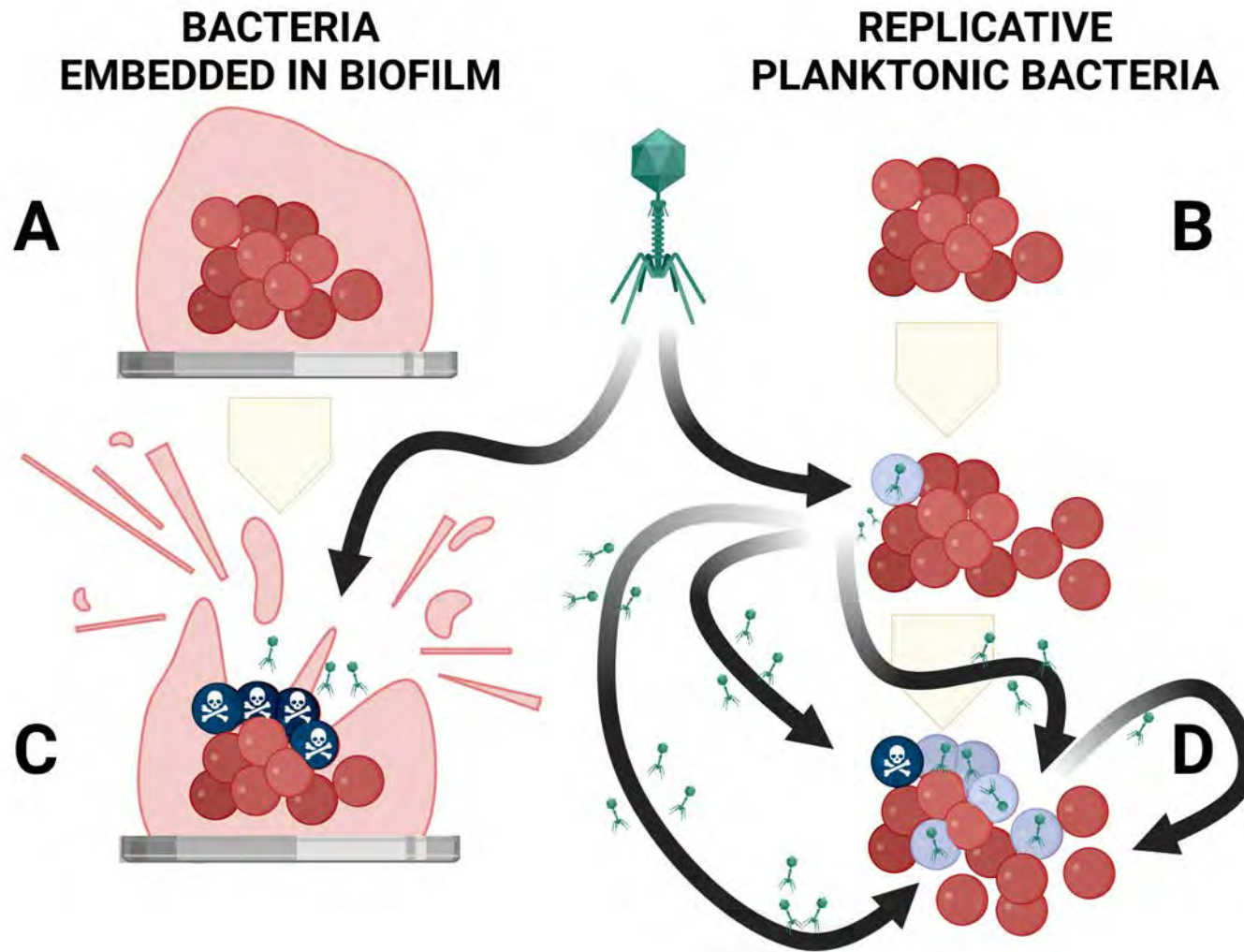
Elaine Luo, Frank O. Aylward,\* Daniel R. Mende,  Edward F. DeLong

Daniel K. Inouye Center for Microbial Oceanography: Research and Education, University of Hawaii, Honolulu, Hawaii, USA



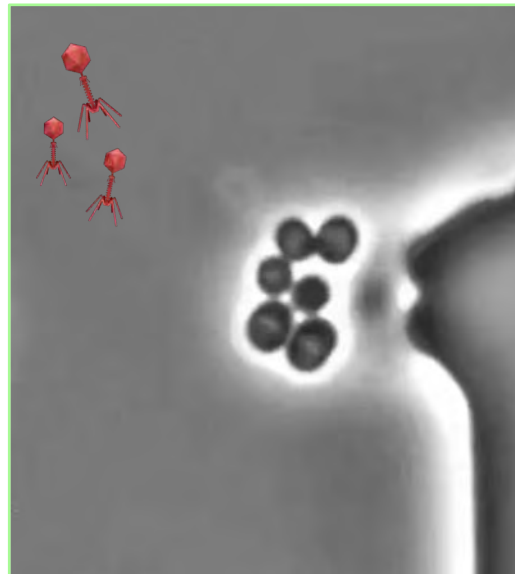
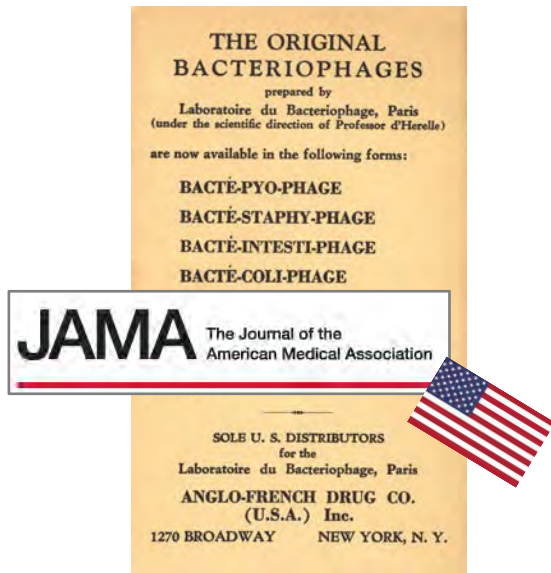
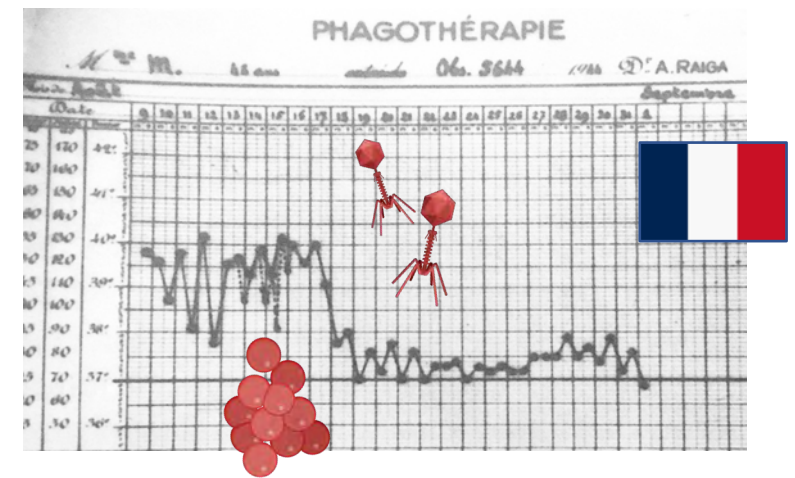


# Finally phages have two ways of actions



# Phage therapy is fascinating

- Viral therapy for bacterial infections
- Story of phage therapy is connected to worldwide geopolitical events
- Failure to implement phage therapy in the west
- Potential incredible preclinical efficacy



*S. aureus* being lysed  
by the Sa2 phage

Bacterial DNA  
appeared in green

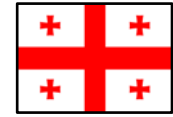
Courtesy Pascal Maguin  
Luciano Marraffini Lab

THE ROCKEFELLER UNIVERSITY





# Story of phage Therapy

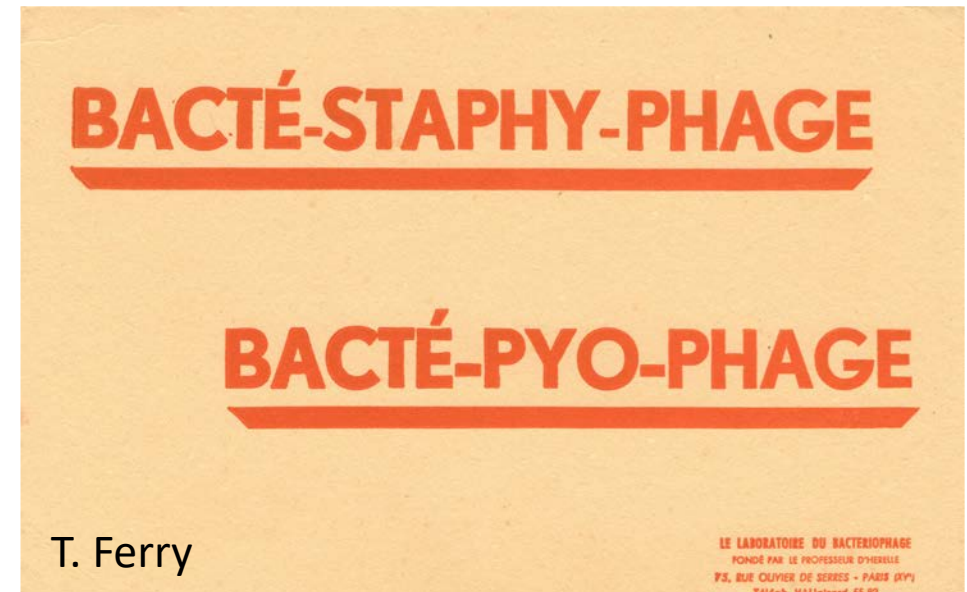


## Creation from F. d'Herelle (dismissed from Pasteur Institute):

- Laboratoire du bactériophage (Paris)
- Eliava Center (Georgia)
  - Fixed cocktails to treat digestive-tract infections
  - Fixed cocktails to treat skin and soft tissue infections



T. Ferry



T. Ferry



# Story of phage Therapy



## Creation from F. d'Herelle (dismissed from Pasteur Institute):

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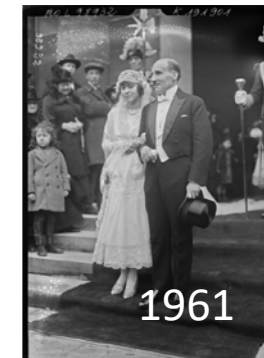
Forbidden to import Georgian phages (not safe for injections)

Don't forget the lessons of the past



Docteur André RAIGA  
Ancien Interne lauréat des Hôpitaux  
Ex-Chef de Clinique chirurgicale à la Faculté

Respect the experience of the East



At the stage of bone necrosis, [the bacteriophage] **will be able to do nothing** against the dead bone deprived of circulation; [it] only needs surgery.



T. FERRY



KEEP  
CALM  
AND USE

PHARMACEUTICAL  
GRADE  
PHAGES

PHAGE  
2.0  
THERAPY

ESCMID MANAGING INFECTIONS  
PROMOTING SCIENCE



ESGNTA

European Society of Clinical Microbiology and Infectious Diseases

ESCMID STUDY GROUP  
FOR NON-TRADITIONAL  
ANTIBACTERIAL THERAPY

Elected Executive Committee:

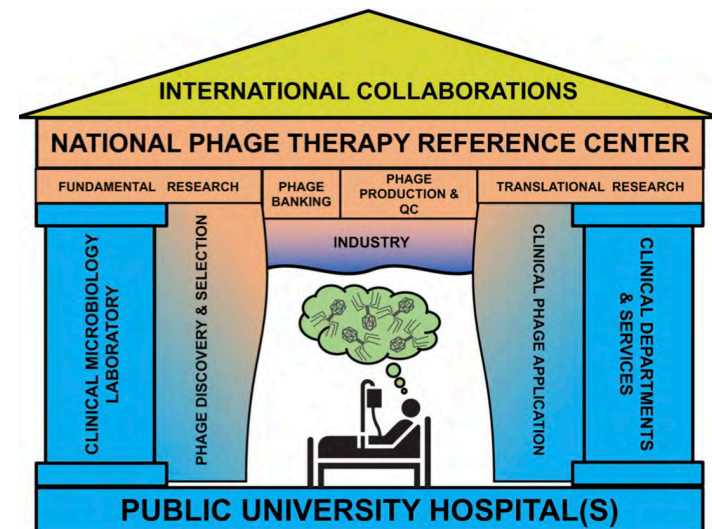
Ran Nir-Paz, Israël

Jean-Paul Pirnay, Belgium

Clinical officer: Tristan Ferry, France

Shawna Mc Callin, Switzerland

Zuzanna Drulis-kawa, Poland



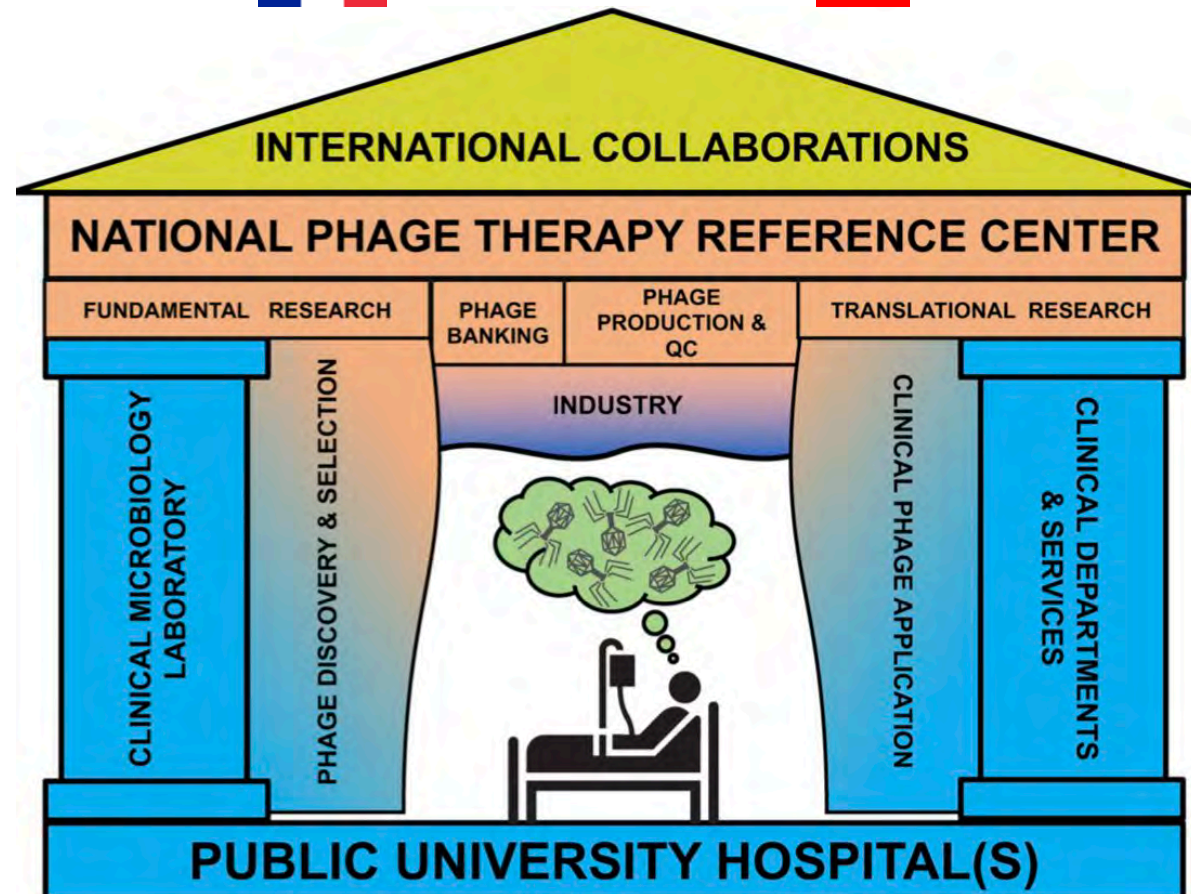
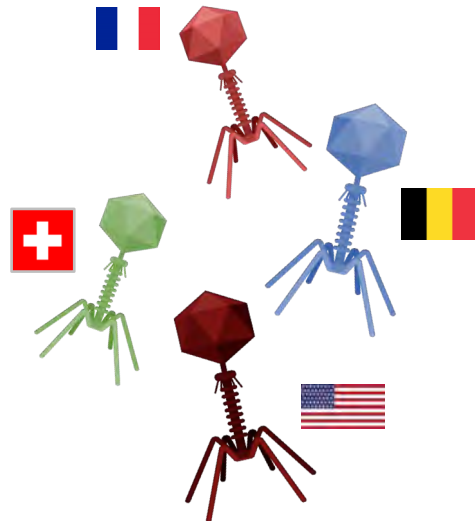
# Recent progress toward the implementation of phage therapy in Western medicine

Jean-Paul Pirnay<sup>1,†</sup>, Tristan Ferry<sup>2,3,†</sup> and Grégory Resch<sup>4,\*,†</sup>

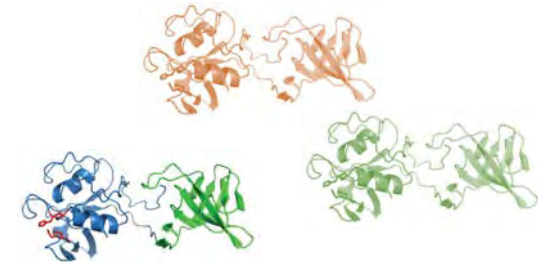


NTA: Non traditional antibacterials

## Phages



## Lysins



**THE MYTHOLOGY  
OF PHAGE THERAPY**



T. FERRY

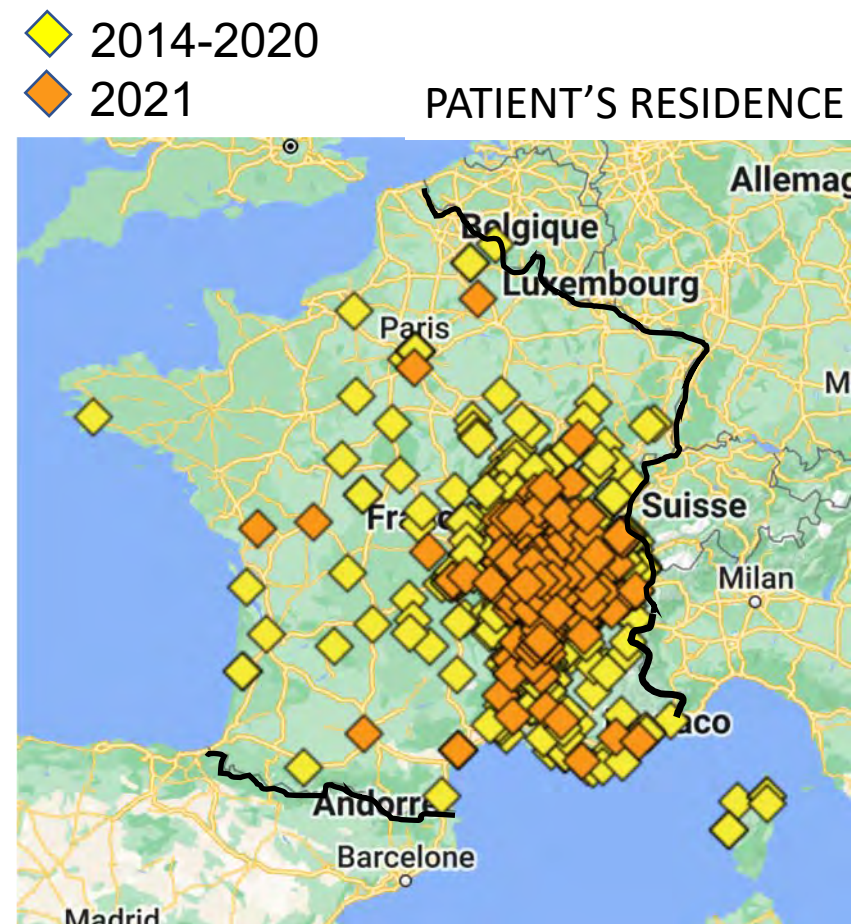
**VS.**

**EBM**

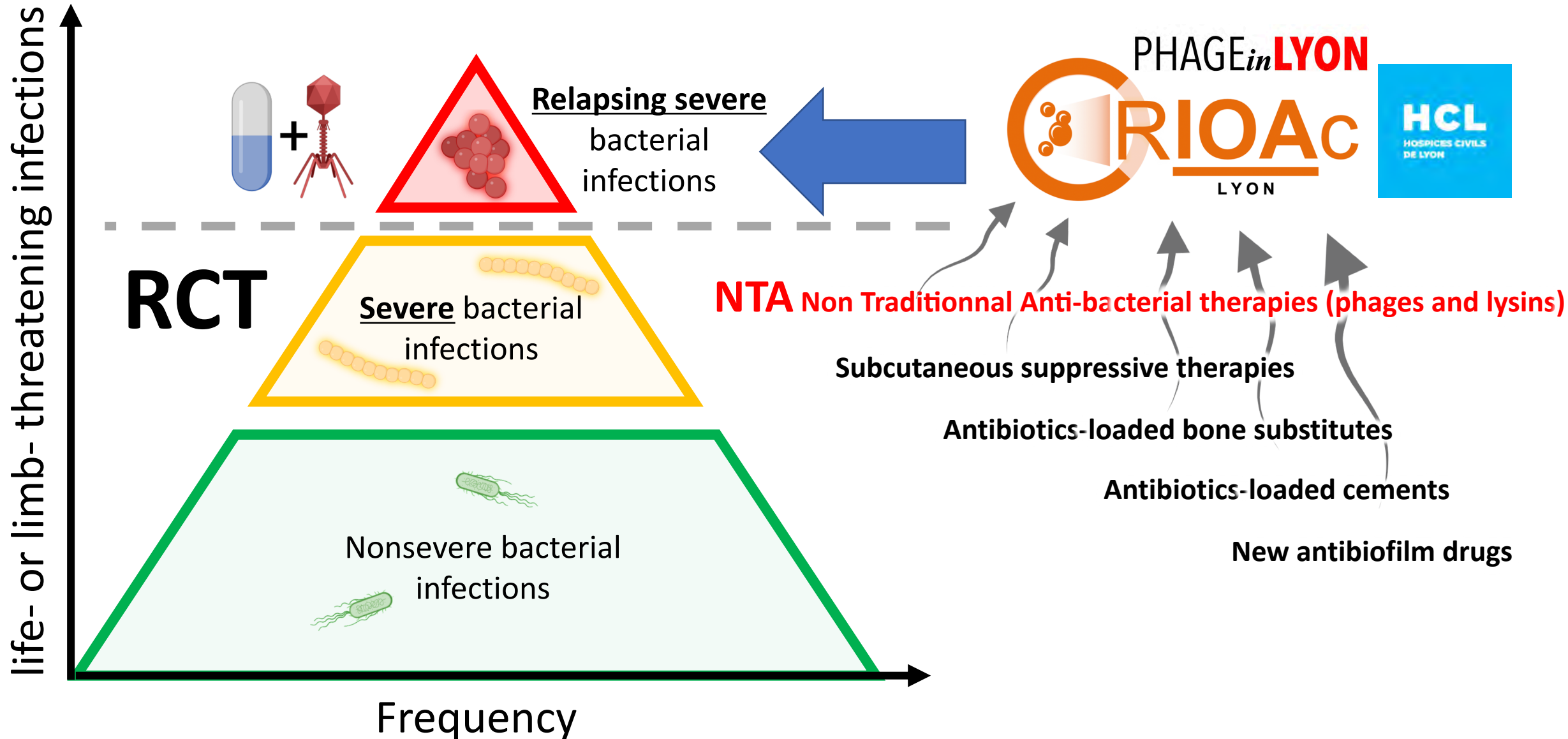
Clinical  
Trials



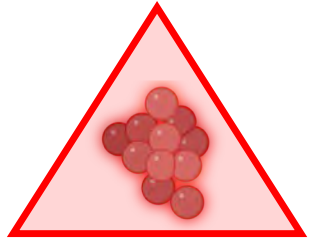
T. FERRY



# The pyramid of bacterial infectious diseases



# A large panel of severe bacterial infections



## Central nervous system infections

Implant-associated meningitis

## Lung infections

Ventilator-associated pneumonia  
Exacerbation in cystic fibrosis  
Exacerbations in bronchiectasis

## Urinary tract infections

Pyelonephritis  
Ureteral stent-associated infection



## Cardiovascular infections

Endocarditis  
Cardiac electronic device infection  
Prosthetic-valve endocarditis  
Vascular graft infection

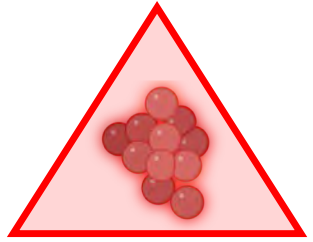
## Muskuloskeletal infections

Wound infection  
Osteomyelitis, fracture-related infection  
Implant-associated bone and joint infection  
Prosthetic joint infection

## Digestive-tract infections

Typhoid fever, shigellosis  
Cholera

# A large panel of severe bacterial infections



## Central nervous system infections

Implant-associated meningitis

## Lung infections

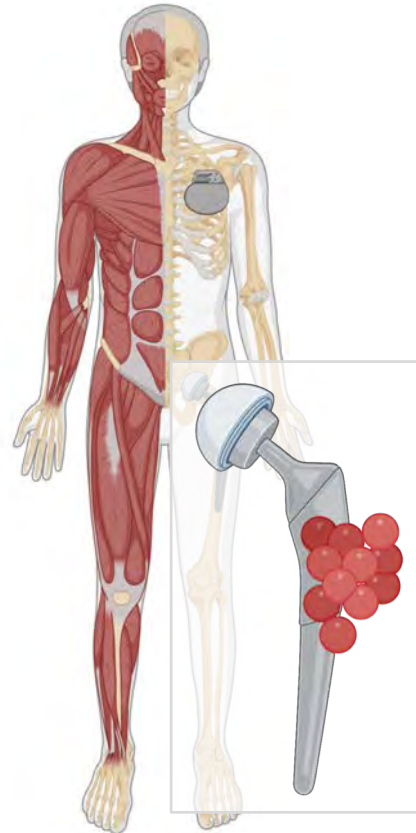
Ventilator-associated pneumonia  
Exacerbation in cystic fibrosis  
Exacerbations in bronchiectasis

## Urinary tract infections

Pyelonephritis  
Ureteral stent-associated infection

## Digestive-tract infection

Typhoid fever, shigellosis  
Cholera



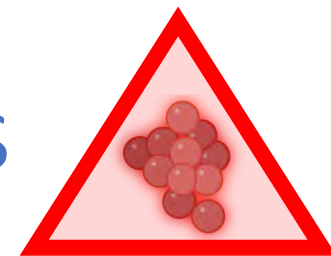
## Cardiovascular infections

Endocarditis  
Cardiac electronic device infection  
Prosthetic-valve endocarditis  
Vascular graft infection

## Muskuloskeletal infections

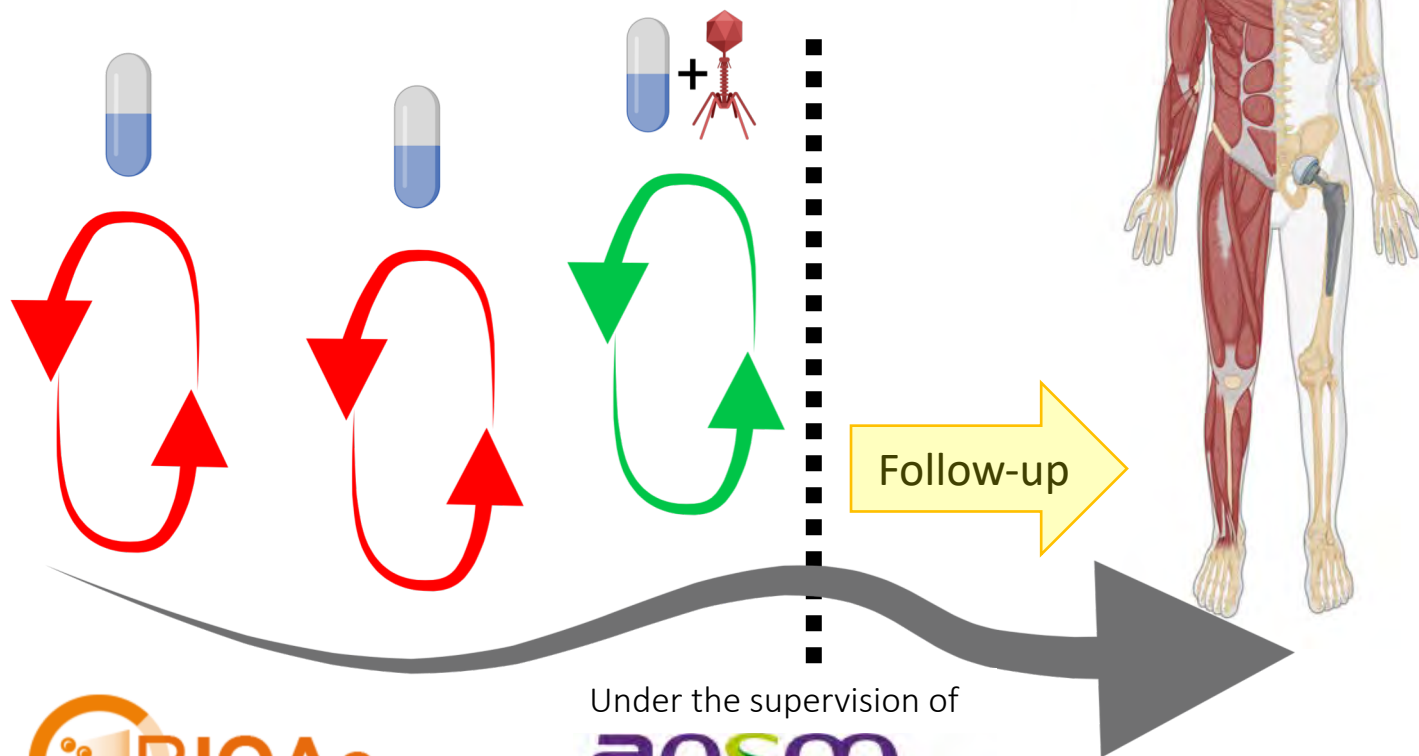
Wound infection  
Osteomyelitis, fracture-related infection  
Implant-associated bone and joint infection  
**Prosthetic joint infection**

# A large panel of severe bacterial infections



Some positive signals  
in these infections

The patient is his “own control”



Under the supervision of



French Health Authority



PHAGE<sub>in</sub>LYON  
Clinic



# PHAGE<sup>in</sup>LYON Clinic

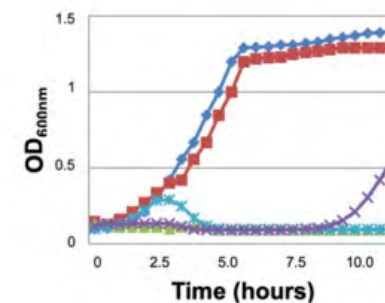
- Dedicated program to **phage therapy** development (**N**on-**T**raditional **A**ntibacterials WHO)
- Close relationship with the **French health authority**
- Integrated in our **referral center** for complex BJI
- For patients in **dead-end** clinical situations or at high risk of significant loss of function
- **Pharmaceutical grade** phages only
- Fulfilling list of **quality controls**
- **Phagogram** demonstrating the phage susceptibility
- Use in **cocktail** ( $\geq$  two active phages), with antibiotics
- Prepared by the **hospital pharmacist** under sterile conditions at the time of injection



World Health  
Organization

ansm

Agence nationale de sécurité du médicament  
et des produits de santé





viruses

Lyon BJI  
study group



PHAGEinLYON



Review

# Past and Future of Phage Therapy and Phage-Derived Proteins in Patients with Bone and Joint Infection

REVIEW ARTICLE

OPEN ACCESS

Tristan Ferry  
Jérôme Josse  
Frédéric Laurent  
on behalf of

## Medical innovations to maintain the function in patients with chronic PJI for whom explantation is not desirable: a pathophysiology-, multidisciplinary-, and experience-based approach

Tristan Ferry<sup>1,2,3,4,\*</sup>, Cécile Batailler<sup>2,3,5</sup>, Sophie Brosset<sup>2,3,6</sup>, Camille Kolenda<sup>2,3,4,7</sup>, Sylvain Goutelle<sup>2,3,8,9</sup>, Elliot Sappey-Marini<sup>2,3,5</sup>, Jérôme Josse<sup>2,3,4,7</sup>, Frédéric Laurent<sup>2,3,4,7</sup>, Sébastien Lustig<sup>2,3,5</sup>, On Behalf of the Lyon BJI Study Group,<sup>a</sup>

Virologie

infection ostéoarticulaire : historique, fondements, faisabilité et perspectives en France

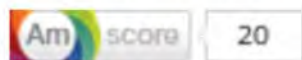
*Phage therapy in bone and joint infection: history, rationale, feasibility and perspectives in France*

# Case Report: Arthroscopic “Debridement Antibiotics and Implant Retention” With Local Injection of Personalized Phage Therapy to Salvage a Relapsing *Pseudomonas Aeruginosa* Prosthetic Knee Infection

Tristan Ferry<sup>1,2,3,4\*</sup>, Camille Kolenda<sup>2,3,4,5</sup>, Cécile Batailler<sup>2,3,6</sup>, Romain Gaillard<sup>3,6</sup>, Claude-Alexandre Gustave<sup>2,3,4,5</sup>, Sébastien Lustig<sup>2,3,6</sup>, Cindy Fevre<sup>7</sup>, Charlotte Petitjean<sup>7</sup>, Gilles Leboucher<sup>8</sup>, Frédéric Laurent<sup>2,3,4,5</sup> and the Lyon BJI Study group

3,743

TOTAL VIEWS



Open Forum Infectious Diseases

BRIEF REPORT

Salvage Debridement, Antibiotics and Implant Retention (“DAIR”) With Local Injection of a Selected Cocktail of Bacteriophages: Is It an Option for an Elderly Patient With Relapsing *Staphylococcus aureus* Prosthetic-Joint Infection?

Tristan Ferry,<sup>1,2,3,4</sup> Gilles Leboucher,<sup>5</sup> Cindy Fevre,<sup>6</sup> Yannick Herry,<sup>2,4,7</sup> Anne Conrad,<sup>1,2,3,4</sup> Jérôme Josse,<sup>2,3,4,8</sup> Cécile Batailler,<sup>2,4,7</sup> Christian Chidiac,<sup>1,2,3,4</sup> Mathieu Medina,<sup>6</sup> S. Lustig,<sup>7</sup> and Frédéric Laurent<sup>2,3,4,8</sup>, on behalf of the Lyon BJI Study Group

VIEWS

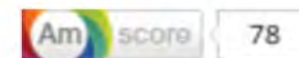
3,770

# Phage Therapy as Adjuvant to Conservative Surgery and Antibiotics to Salvage Patients With Relapsing *S. aureus* Prosthetic Knee Infection

Tristan Ferry<sup>1,2,3,4\*</sup>, Camille Kolenda<sup>2,3,4,5</sup>, Cécile Batailler<sup>2,3,6</sup>, Claude-Alexandre Gustave<sup>2,3,4,5</sup>, Sébastien Lustig<sup>2,3,6</sup>, Matthieu Malatray<sup>3,6</sup>, Cindy Fevre<sup>7</sup>, Jérôme Josse<sup>2,3,4,5</sup>, Charlotte Petitjean<sup>7</sup>, Christian Chidiac<sup>1,2,3,4</sup>, Gilles Leboucher<sup>8</sup> and Frédéric Laurent<sup>2,3,4,5</sup> on behalf of the Lyon BJI Study group

5,711

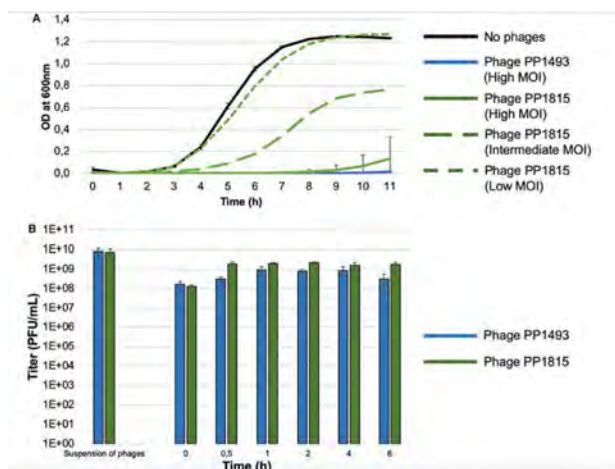
TOTAL VIEWS



# The Potential Innovative Use of Bacteriophages Within the DAC® Hydrogel to Treat Patients With Knee Megaprosthesis Infection Requiring “Debridement Antibiotics and Implant Retention” and Soft Tissue Coverage as Salvage Therapy

Tristan Ferry<sup>1,2,3,4\*</sup>, Cécile Batailler<sup>2,3,5</sup>, Charlotte Petitjean<sup>6</sup>, Joseph Chateau<sup>7</sup>, Cindy Fevre<sup>6</sup>, Emmanuel Forestier<sup>8</sup>, Sophie Brosset<sup>7</sup>, Gilles Leboucher<sup>9</sup>, Camille Kolenda<sup>2,3,4,10</sup>, Frédéric Laurent<sup>2,3,4,10</sup> and Sébastien Lustig<sup>2,3,5</sup> on behalf of the Lyon BJI Study Group

4,970  
TOTAL VIEWS



*J Antimicrob Chemother* 2018; **73**: 2901–2903  
doi:10.1093/jac/dky263  
Advance Access publication 27 July 2018

## Innovations for the treatment of a complex bone and joint infection due to XDR *Pseudomonas aeruginosa* including local application of a selected cocktail of bacteriophages

Tristan Ferry<sup>1–4\*</sup>, Fabien Boucher<sup>1,4,5</sup>, Cindy Fevre<sup>6</sup>, Thomas Perpoint<sup>1,4</sup>, Joseph Chateau<sup>1,2,4,5</sup>, Charlotte Petitjean<sup>6</sup>, Jérôme Josse<sup>2–4,7</sup>, Christian Chidiac<sup>1,2–4</sup>, Guillaume L’hostis<sup>6</sup>, Gilles Leboucher<sup>8</sup> and Frédéric Laurent<sup>2–4,7</sup> on behalf of the Lyon Bone and Joint Infection Study Group<sup>†</sup>

CITATIONS



VIEWS



ALTMETRIC

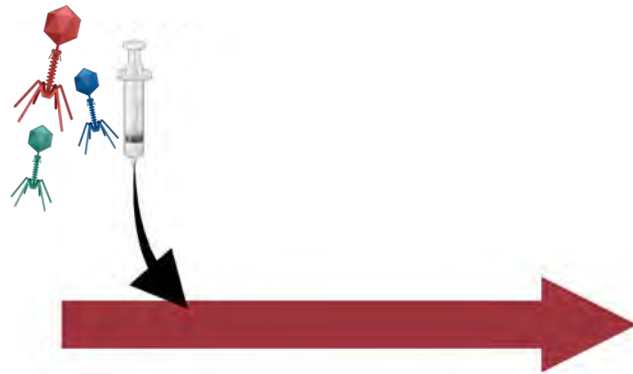
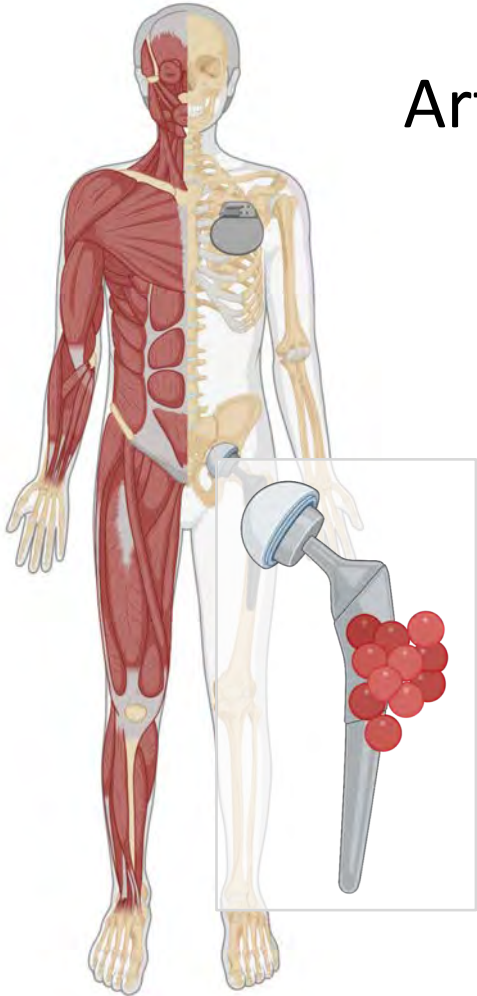


More metrics information

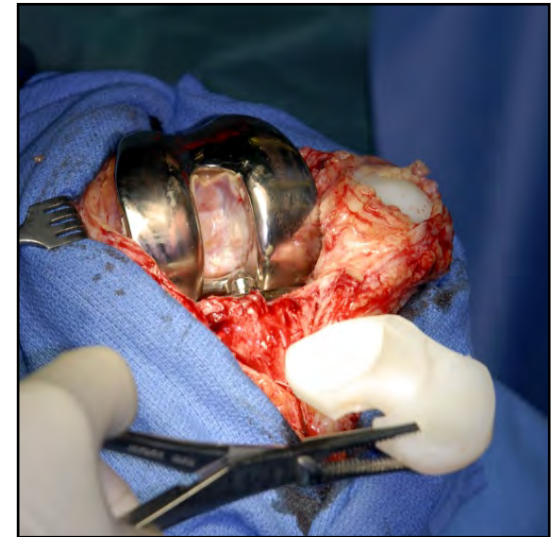
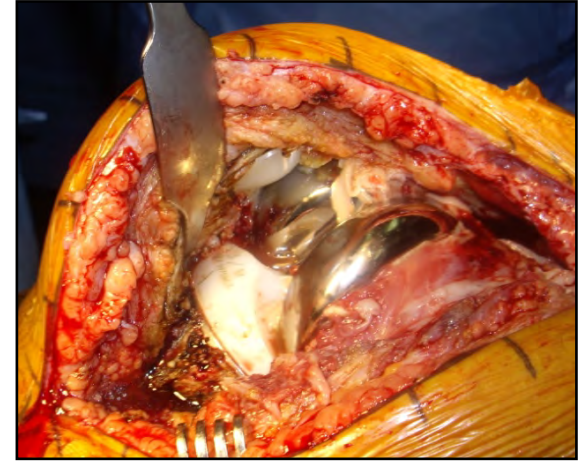
# PHAGE<sup>in</sup> **LYON** *Clinic*

Arthroscopic or open


## DAIR



Open DAIR  
(Arthrotomy)



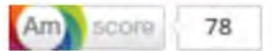
*Courtesy S. Lustig*

Case series  procedure called « PhagoDAIR »

# Phage Therapy as Adjuvant to Conservative Surgery and Antibiotics to Salvage Patients With Relapsing *S. aureus* Prosthetic Knee Infection

5,711

TOTAL VIEWS



*Tristan Ferry<sup>1,2,3,4\*</sup>, Camille Kolenda<sup>2,3,4,5</sup>, Cécile Batailler<sup>2,3,6</sup>, Claude-Alexandre Gustave<sup>2,3,4,5</sup>, Sébastien Lustig<sup>2,3,6</sup>, Matthieu Malatray<sup>3,6</sup>, Cindy Fevre<sup>7</sup>, Jérôme Josse<sup>2,3,4,5</sup>, Charlotte Petitjean<sup>7</sup>, Christian Chidiac<sup>1,2,3,4</sup>, Gilles Leboucher<sup>8</sup> and Frédéric Laurent<sup>2,3,4,5</sup> on behalf of the Lyon BJI Study group*



## #PhagoDAIR

Debridement Antibiotics and Implant Retention

CASE REPORT

published: 16 November 2020  
doi: 10.3389/fmed.2020.570572



# Clinical cases (2<sup>nd</sup> treated patient)

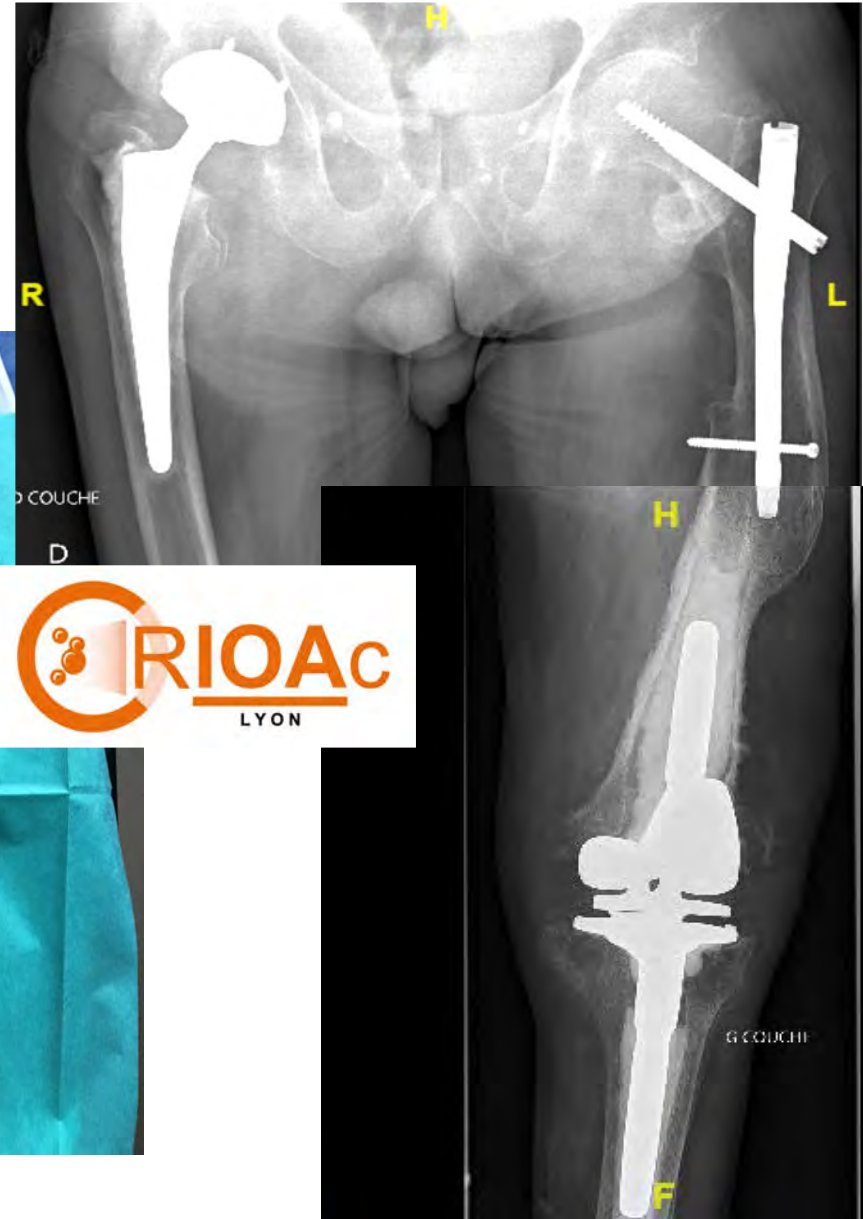
80-year-old man

**Relapsing *S. aureus* prosthetic left knee infection** (past revision)

Failure

Complex orthopaedic situation with past femoral fracture

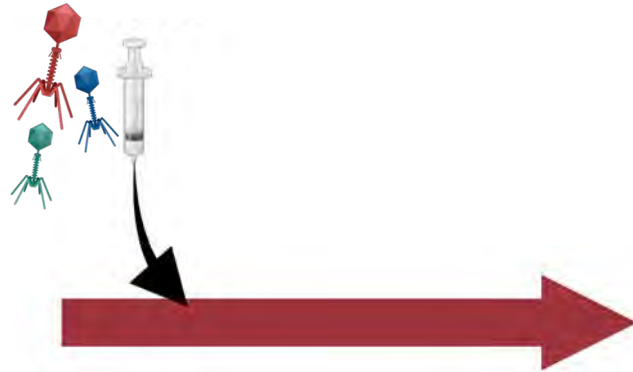
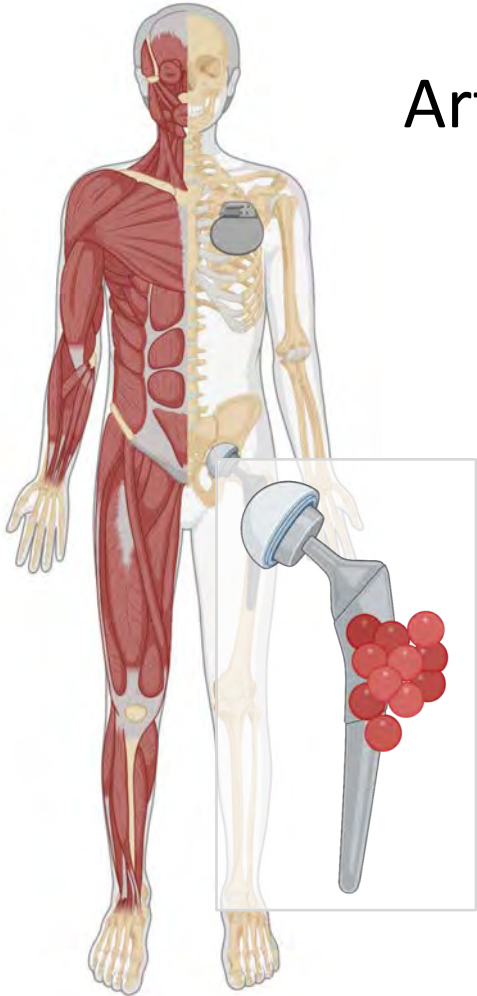
Impossible to walk (painful knee)



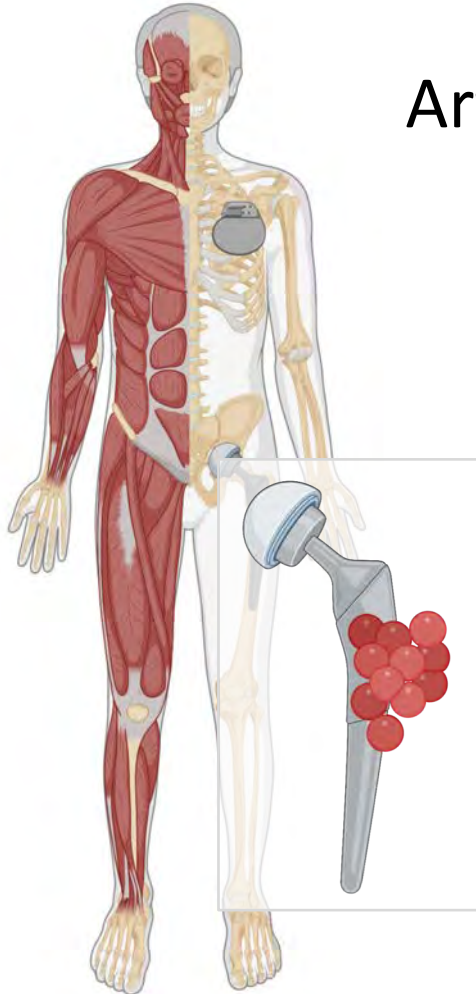
# PHAGE<sup>in</sup> **LYON** *Clinic*

Arthroscopic or open

## DAIR



# PHAGE<sup>in</sup> **LYON** *Clinic*



Arthroscopic or open

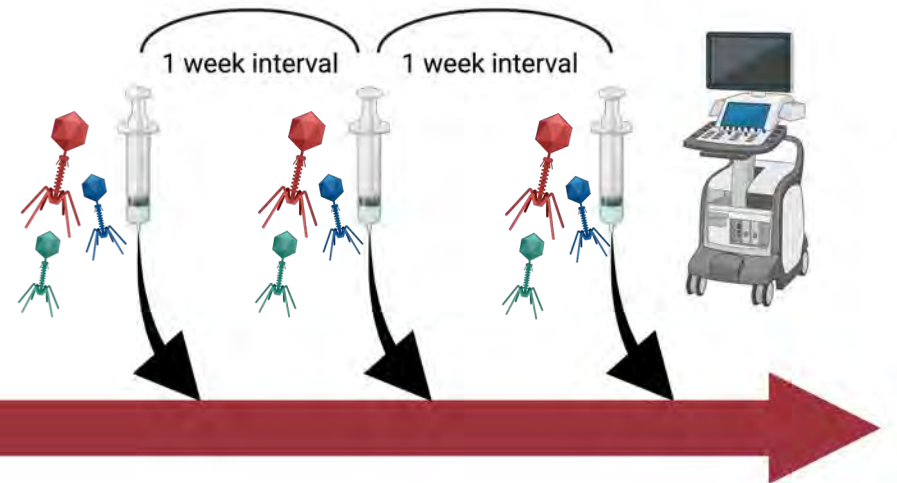
## DAIR



in case of relapse

OR after DAIR if no phages were available at the time of the DAIR\*

OR if no DAIR could be performed



Abstract number: 2508

33rd **ECCMID** EUROPEAN CONGRESS OF  
CLINICAL MICROBIOLOGY  
AND INFECTIOUS DISEASES

**Copenhagen, Denmark**  
15–18 April 2023

# “PhagoDAIR”



**One shot peroperative phage  
application after “DAIR”**



**PHAGE***in***LYON**





**Favorable outcome  
at 2 years**



*"The bacteriophages saved my life, he insists. I never thought one day to walk again. And to say that doctors were talking about cutting my leg off!"* R.N.



**PHAGE***in***LYON**



# PhagoDAIR I

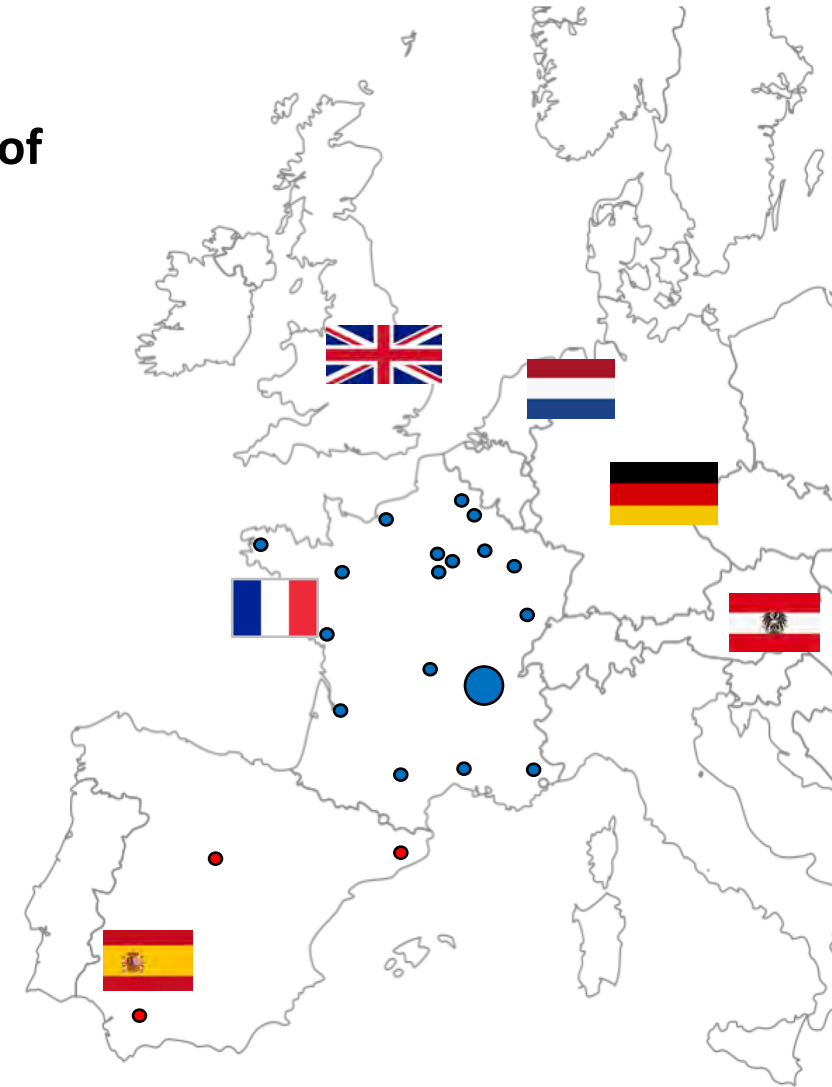
A Pilot, Multicenter, Randomized, Non-Comparative, Double-Blind Study of Phage Therapy in Patients with Hip or Knee PJI due to *S. aureus* Treated with DAIR and Antibiotic Therapy

## Inclusion Criteria

1. *S. aureus* monomicrobial knee or hip PJI with clinical signs of infection with indication of DAIR and Suppressive Antibiotics Therapy (SAT).
2. Phagogram displaying the susceptibility of the strain to at least one of the anti-*Staphylococcus aureus* bacteriophages

## Primary Objective

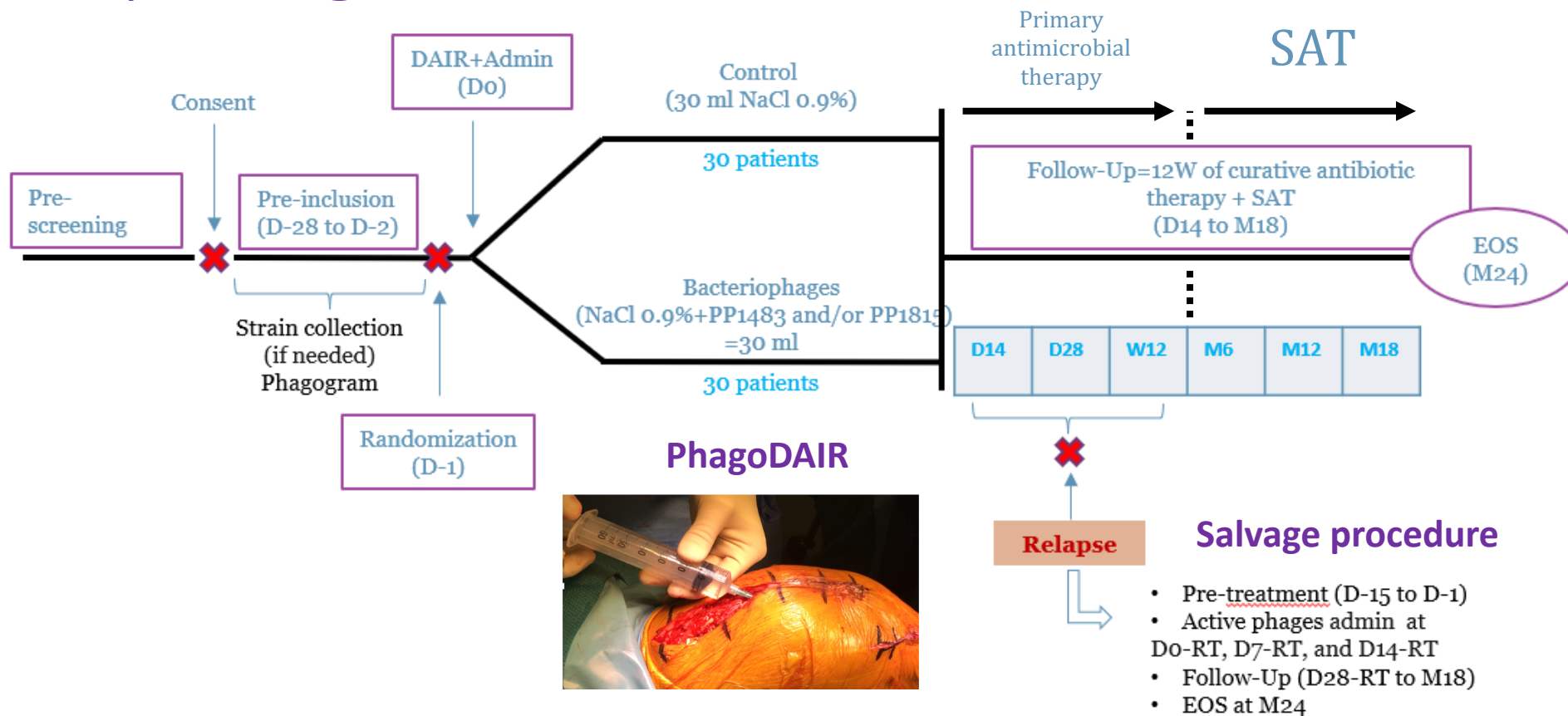
To estimate the rate of clinical control of infection at Week 12 $\pm$ 2 which will allow to calculate the sample size for future comparative studies.



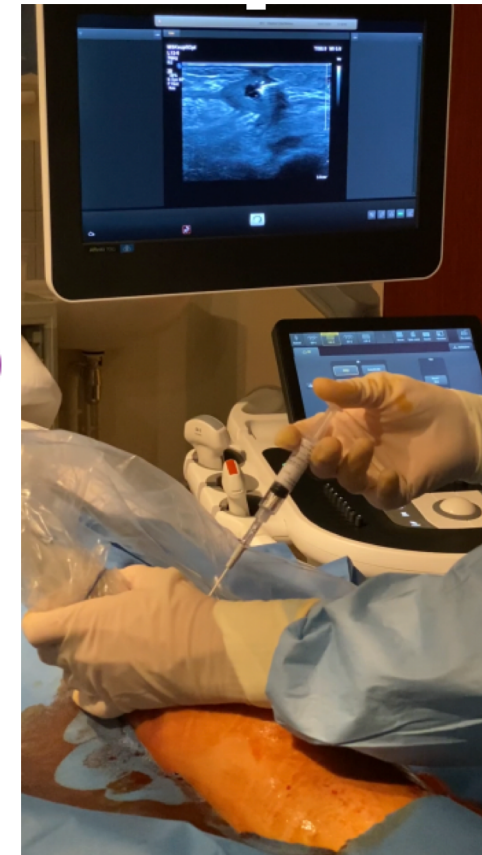
# PhagoDAIR I

A Pilot, Multicenter, Randomized, Non-Comparative, Double-Blind Study of  
Phage Therapy in Patients with Hip or Knee PJI due to *S. aureus*  
Treated with DAIR and Antibiotic Therapy

## Study design



## Salvage procedure



# Clinical case (3<sup>rd</sup> treated patient)

Arthroscopic DAIR with phages to salvage  
*P. aeruginosa* prosthetic knee infection

frontiers  
in Medicine  
2021

88-year-old man

Relapsing *P. aeruginosa* prosthetic left  
knee infection

End-stage cardiac failure

Contraindicated to open DAIR



PHAGE<sub>in</sub>LYON



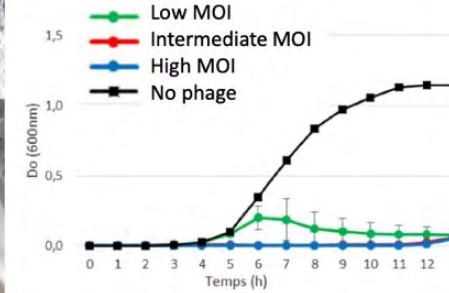
A



Left PKI with purulent  
joint effusion

B

Phage 1450



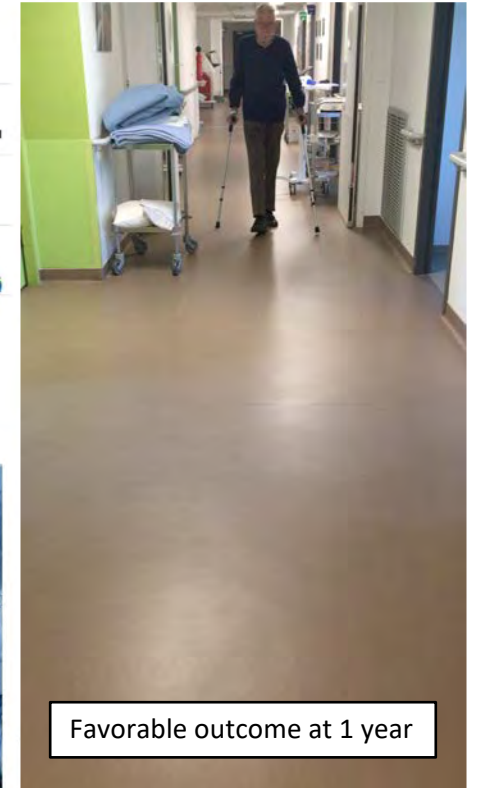
Phagogram (Killing assay)



Arthroscopic DAIR

C

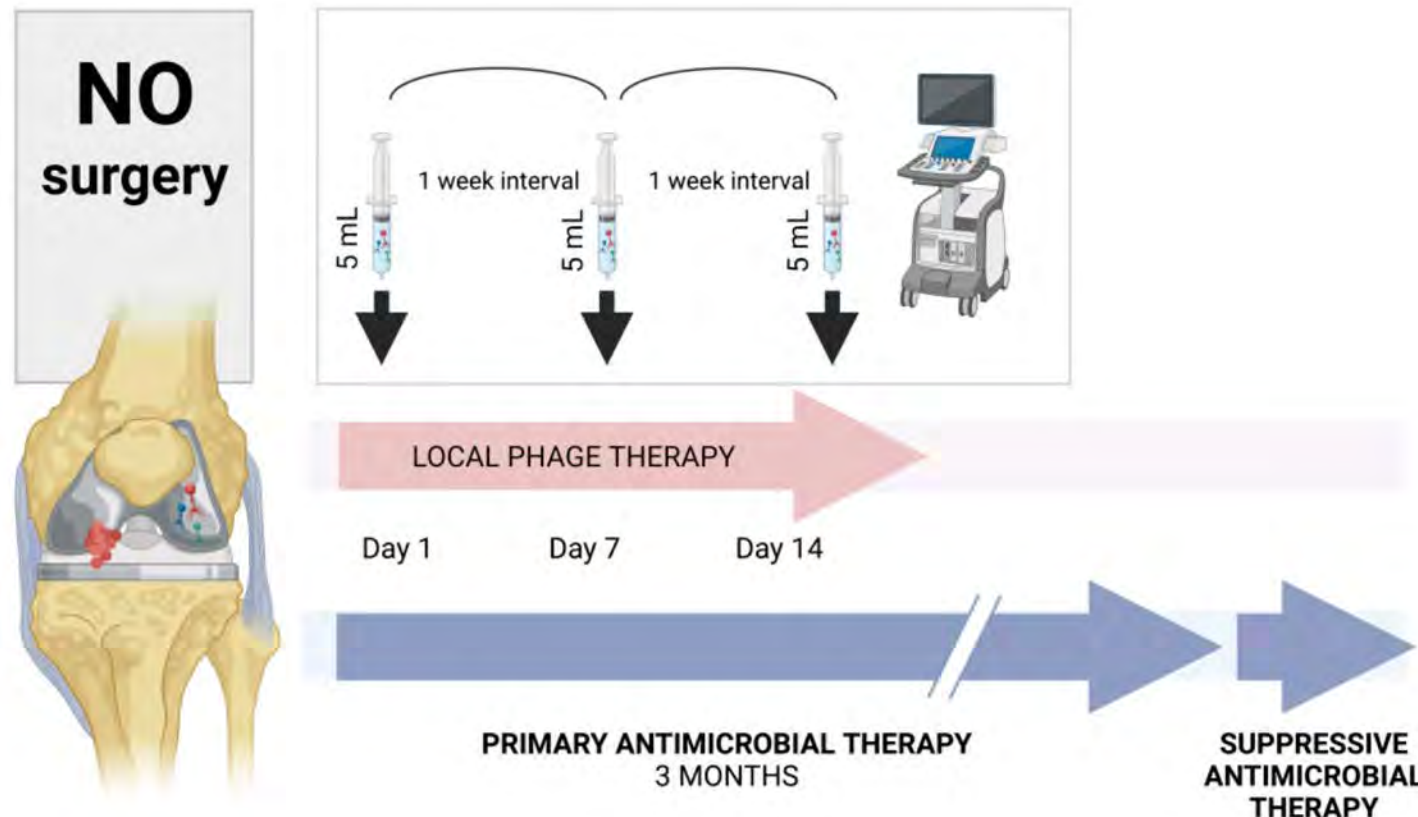
D



Favorable outcome at 1 year

## Exclusive medical treatment combining intraarticular injections of active bacteriophages as adjuvant therapy to antibiotics in patients with *S. aureus* complex PJI contraindicated for, or refusing, surgery

- Five patients (age range 63-79 years) who failed previous treatment for *S. aureus* PJI
- One patient was co-infected with methicillin-resistant *S. epidermidis*



33rd **ECCMID**

**Copenhagen, Denmark**  
15–18 April 2023

Abstract number: 03966

## Exclusive medical treatment combining intraarticular injections of active bacteriophages as adjuvant therapy to antibiotics in patients with *S. aureus* complex PJI contraindicated for, or refusing, surgery

- Five patients (age range 63-79 years) who failed previous treatment for *S. aureus* PJI
- One patient was co-infected with methicillin-resistant *S. epidermidis*
- During the follow-up:
  - All patients were improved by the treatment
  - One experienced a relapse with *S. aureus* at month 8 under SAT
  - The patient co-infected with *S. epidermidis* experienced a relapse due to the *S. epidermidis* at month 17 (but not *S. aureus*)
- The disease was totally under control with disappearance of clinical signs of infection for the three other patients at month 6

33rd ECCMID

Copenhagen, Denmark  
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Abstract number: 03966

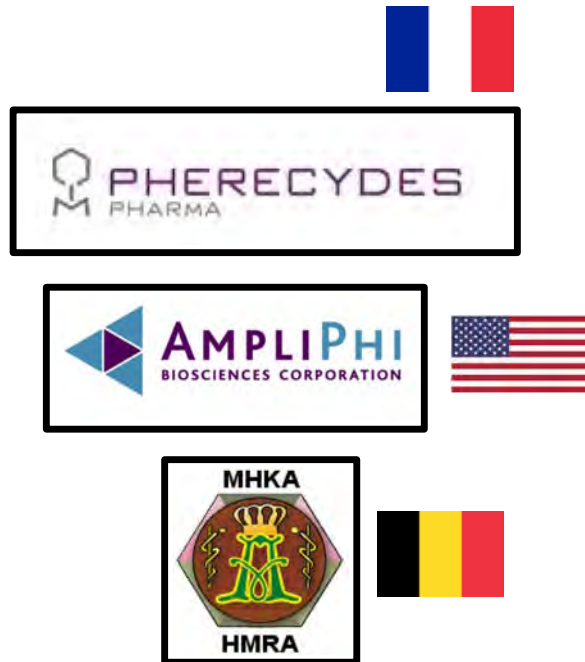
# Unique European academic collaboration

## Clinical case (12<sup>th</sup> treated patient)

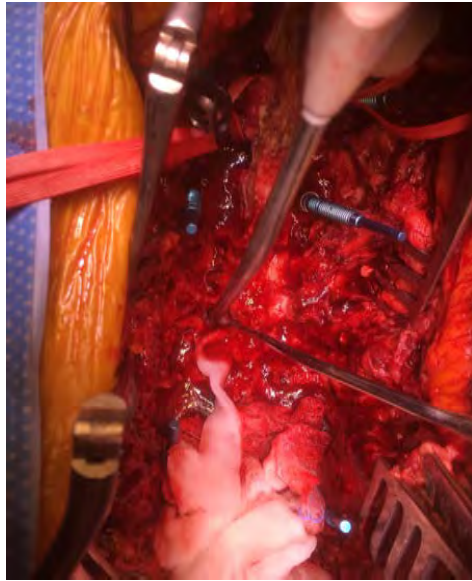
Spondylodiscitis with spinal abscess

Pandrug-resistant *P. aeruginosa*

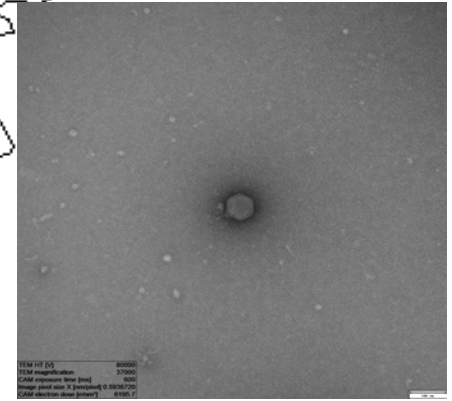
The strain was  
**resistant**  
to the available  
bacteriophages !!!



# Unique European academic collaboration



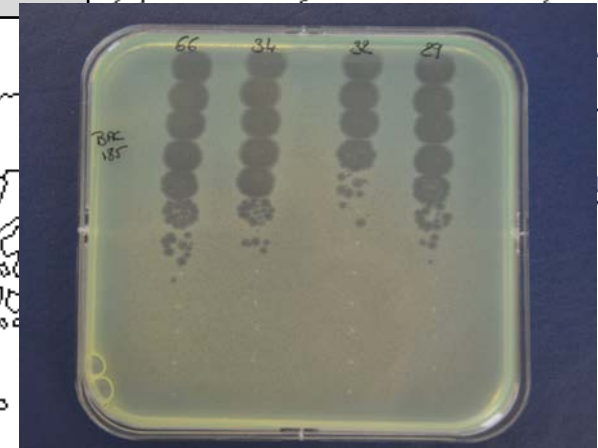
Lyon Phage team



Jean-Paul Pirnay



Gregory Resch

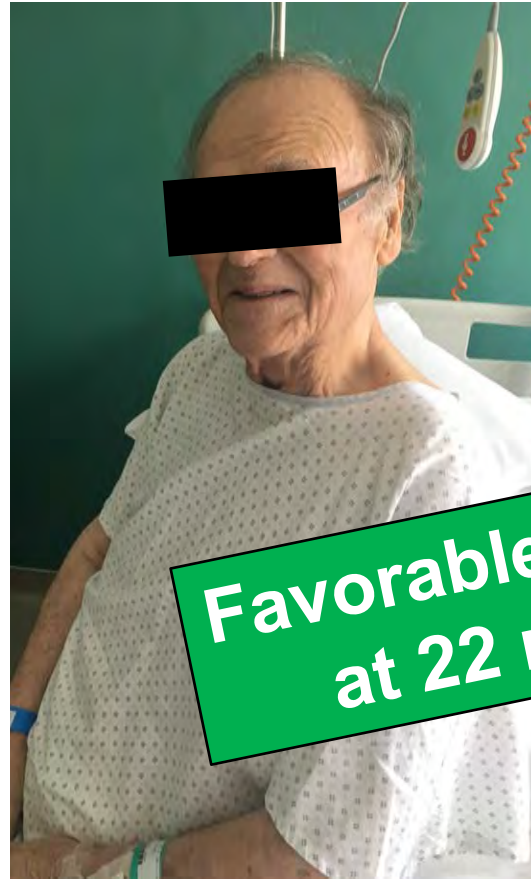


Under the supervision of



French Health Authority

# Unique European academic collaboration



**Favorable outcome  
at 22 months**



T. FERRY et al. 2022



Under the supervision of



French Health Authority

**Conclusions:** Personalized phage therapy is a potential adjuvant treatment for patients with complex BJI due to pandrug-resistant bacteria. **In addition to industrial phages under development, academic collaborative research is crucial to develop personalized phage therapy.**

# Implementation of a Phage Therapy Center in a CRIOAc

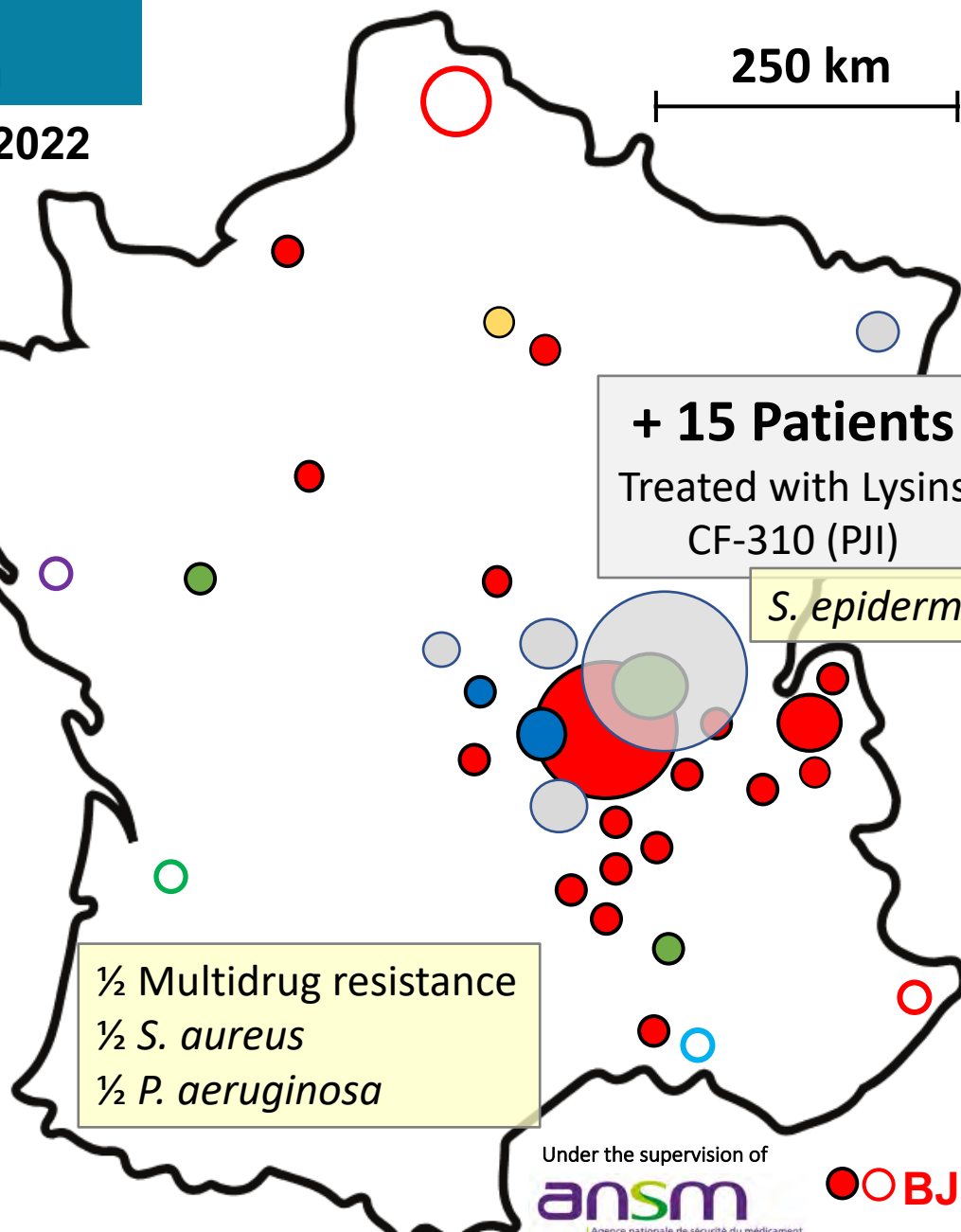
**CMI** CLINICAL  
MICROBIOLOGY  
AND INFECTION

FERRY T. *et al.* 2022

Updated



**PHAGE***in***LYON**



**54 patients in Lyon since 2017**

~80% of the whole patients treated in France



• 50 with phages from **PHERECYDES PHARMA**

• 4 with phages from **MHKA HMRA**



• 43 **BJI** (including 34 **PJI**)

• 8 **endocarditis/vascular graft/**  
**cardiac electronic device infection**



• 3 **lung infections** (VAP + bacteremia,  
pneumonia in lung graft bronchiectasia,  
cystic fibrosis exacerbation)

**+ 12 patients managed outside Lyon ○**  
including 1 in and 1 in

## **P** Bone and joint infections: Lyon becomes the national expert center for phage therapy

The reference center for complex bone and joint infections, based at the Hospices Civils de Lyon, will centralize all requests concerning this last resort treatment, using viruses against resistant bacteria.

Le Progrès - 23 Feb. 2023 at 17:51 | updated 23 Feb. 2023 at 18:08 - Reading time: 2 min



National online  
multidisciplinary meetings

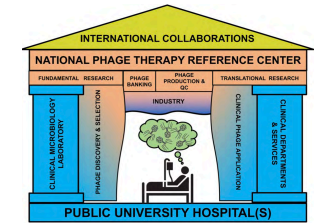


Dedicated to innovative  
anti-infective therapies



# Conclusion

- Phage therapy has a **high potential** in patients with BJI, as **adjuvant to antibiotics**
- **Patients with chronic PJI who could be managed with a conservative approach, particular patients in dead-in clinical situation**
- Complex personalized therapy (specific to the infecting strain, various scheme of administrations, etc.)
- **Few pharmaceutical grade phages are available at this time**
- Phage therapy center(s) in each country would be useful to concentrate the experience and to promote interactions
- **In addition to industrial phages under development, academic collaborative research is crucial to develop personalized phage therapy.**
- Parliament discussions in the UK, and Phage-UK initiative
- **Growing clinical evidence and clinical trials are coming**



**THE MYTHOLOGY**  
OF PHAGE THERAPY



T. FERRY

**EBM**

Clinical  
Trials



T. FERRY

# Lyon BJI Study group



**Coordinator: Tristan Ferry**

**Infectious Diseases Specialists – Tristan Ferry**, Florent Valour, Thomas Perpoint, Florence Ader, Sandrine Roux, Agathe Becker, Claire Triffault-Fillit, Anne Conrad, Cécile Poudroux, Pierre Chauvelot, Paul Chabert, Johanna Lippman, Evelyne Braun

**Surgeons – Sébastien Lustig**, Elvire Servien, Cécile Batailler, Stanislas Gunst, Axel Schmidt, Elliot Sappey-Marinier, Quentin Ode, Michel-Henry Fessy, Anthony Viste, Jean-Luc Besse, Philippe Chaudier, Lucie Louboutin, Adrien Van Haecke, Marcelle Mercier, Vincent Belgaid, Aram Gazarian, Arnaud Walch, Antoine Bertani, Frédéric Rongieras, Sébastien Martres, Franck Trouillet, Cédric Barrey, Ali Mojallal, Sophie Brosset, Camille Hanriat, Hélène Person, Samuel Prive, Philippe Céruse, Carine Fuchsmann, Arnaud Gleizal;

**Anesthesiologists – Frédéric Aubrun**, Mikhail Dziadzko, Caroline Macabéo, Dana Patrascu;

**Microbiologists – Frederic Laurent**, Laetitia Beraud, Tiphaine Roussel-Gaillard, Céline Dupieux, Camille Kolenda, Jérôme Josse;

**Imaging – Fabien Craighero**, Loic Boussel, Jean-Baptiste Pialat, Isabelle Morelec;

**PK/PD specialists – Michel Tod**, Marie-Claude Gagnieu, Sylvain Goutelle;

**Clinical research assistant and database manager– Eugénie Mabrut**

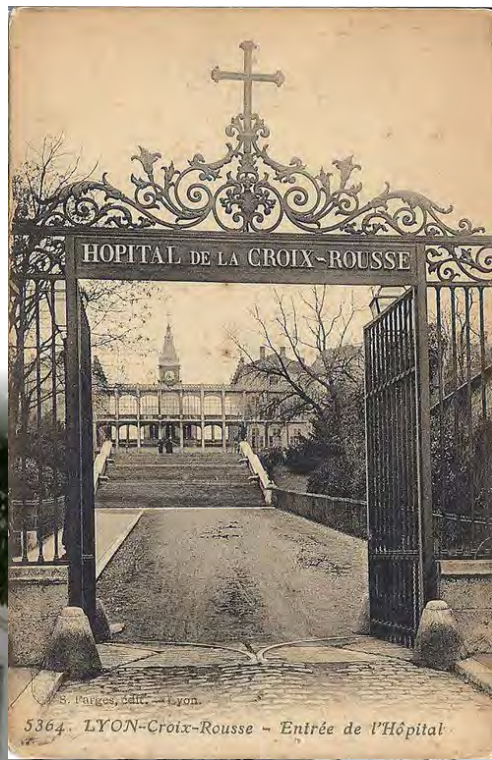
## PHAGE<sub>in</sub>LYON

**Coordinator: Tristan Ferry (clinic); and Frederic Laurent (lab)**

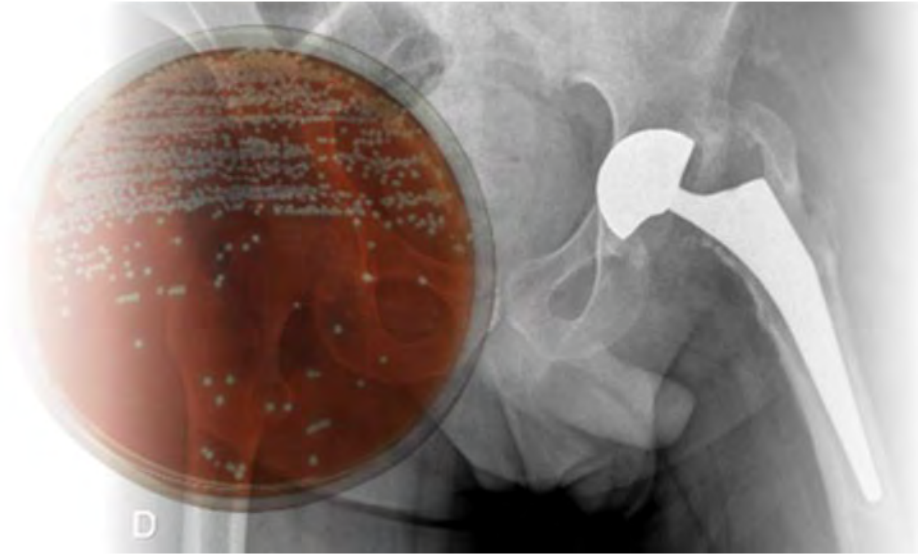
Myrtille Le Bouar, Gilles Leboucher, Thomas Briot; Mathieu Medina, Camille Kolenda, Floriane Laumay, Melanie Bonhomme, Leslie Blazere, Tiphaine Legendre, Eline Terrazzoni, Fabrice Pirot, Camille Merienne, Samira Filali, Benjamine Lapras



# Croix-Rousse Hospital



<http://www.crioac-lyon.fr>



- Published cases
- Open acces studies in pdf
- All thesis in pdf
- All recommendations
- **Newsletter**



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