The George Eliava Institute - a pioneer of phage research and phage therapy

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Eliava IBMV

Euro-Bio 2006

Düsseldorf, Germany

G. Eliava Institute of Bacteriophage, Microbiology and Virology

- George Eliava and a French-Canadian Felix D'Herelle came across in 1920's in the Pasteur Institute in Paris ;
- The main idea of G. Eliava and F. D'Herelle - creation of the World Centre of Phage Research in Tbilisi
- George Eliava was executed in 1937

G. Eliava Institute Today

- **Large territory** - 4,6 ha land in the center of the city
- Animal facility – 34 Ha in Dzegvi (20 km from Tbilisi)
- **6 main buildings**
- **Employees** - 85 , among them :
  - Scientists – 48
  - Administrative Stuff -6 ;
- **11 Laboratories**

G. Eliava IBMV Laboratories

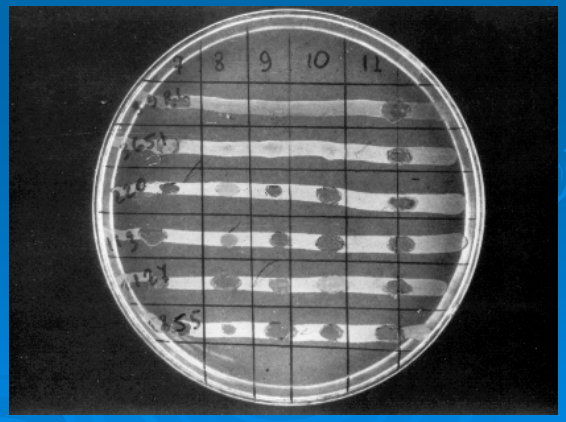
- Microbiology
- Biochemistry
- Morphology and Biology of Bacteriophages
- Selection and Taxonomy of phages
- Brucella and Anaerobic Bacteriophages
- Immunology
- Standardization and Deposition of Bacteriophages
- Biotechnology and Gene Engineering
- Microbial Ecology
- Genetics of Microorganisms
- Virology

Experimental Production Department

Regional Experimental Center (RECAMBR)

Research Areas

- Bacteriophage Research
- Phage therapy /prophylaxis
- Clinical Microbiology
- Food Microbiology
- Environmental Microbiology
- Infectious Immunology
- Biotechnology
- Microbial Genetics
- Microbial Risk assessment
- Biodefence
- Plant protection



Biological products elaborated at the Eliava IBMV

- More than 50 Biopreparations
- Vaccines (anthrax, rabies, etc.),
- Anatoxins (Diphteriae, staphylococcus etc.),
- Immune sera / globulins (anti-anthrax, anti-staphylococcus, anti-tetani etc.)
- Bacterial enzyme preparations (Bilidase)
- Anti-viral preparations (human and swine interferon)
- Probiotics / Eubiotics
- Bacteriophages - 55% of total products

G. Eliava Institute
Practical Application of phages

- Largest collection of phage clones
- Natural living phages

- *Diagnostics/detection*
- *Prevention*
- *Treatment*

Types and Pharmaceutical forms of phage preparations

- Monoclonal phages (e.g Intravenous Staph phage)
- Monovalent preparations (“Staph phage’)
- Polyclonal phages (e.g. Salmonella phages)
- Polyvalent preparations (e.g. ”Piophage”)

- Liquid
- Dry (tablets)
- Aerosol
- Soft (suppositories, salves)

Bacteriophage preparations for treatment and prophylactics of intestinal disorders / enteric infections

Salmonella phage preparation

- **11 components** , active against
- ***S. typhimurium***
- ***S. cholera suis***
- ***S. dublin,***
- ***S. enteritidis***
- ***S. paratyphi A, B***
- ***S. newport etc***

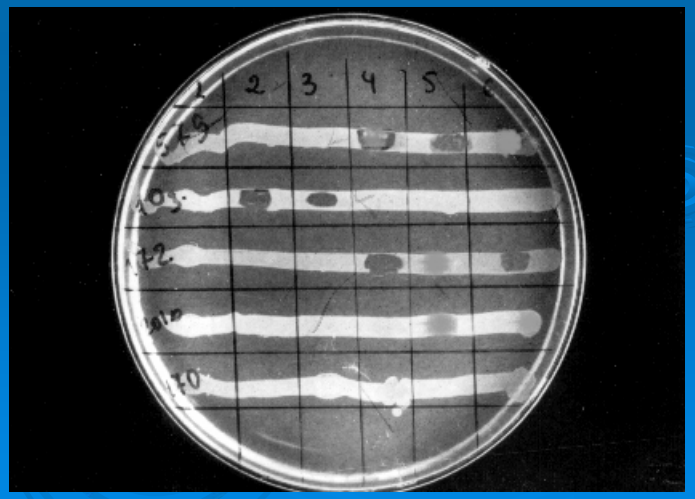
- **INTESTY-bacteriophage**
- **17 components ,** active against
- ***Shigella* (3 comp.)**
- ***Salmonella* (6 comp.)**
- ***E.coli* (5 comp.)**
- ***Enterococcus* (2 comp)**
- ***Staphylococcus* (2comp)**
- ***Proteus*(2 comp.)**
- ***Pseudomonas aeruginosa***

Phage research at Eliava

Elaboration of phage typing scheme for *Salmonella typhimurium*:

(*I. Chirakadze. T. Chanishvili, 1974 - 1980*)

- **1100 phage clones** isolated
- **164 clones selected** and characterized
- **18 type phages selected** for typing set
- **19970 strains studied**
- **96, 4% typed**
- **40 phage types** revealed



Phage preparations commercially produced in Eliava Institute in 1984

***Bacteriophages for Treatment and Prophylaxis* :**

- **Disenterial Bacteriophage dry (in tablets)**
- **Bacteriophage against Typhoid fever dry (in tablets)**
- **Salmonella Bacteriophage dry (in tablets)**
- **Staphylococcal bacteriophages liquid for topical applications**
- **Staphylococcal bacteriophages liquid for injections**
- **Staphylococcal bacteriophages for intravenous use**
- **Streptococcal bacteriophages liquid**
- **Pyoceaneus(*P. aerugionosa*) bacteriophage liquid**
- **Coli-bacteriophage liquid**

(*according to I. Georgadze, 1984*)

Phage preparations commercially produced in Eliava Institute in 1984

- **Diagnostic bacteriophages**

- Diagnostic Salmonella Bacteriophages
- Diagnostic - Dysenterial bacteriophages

- **Bacteriophages for phage-typing**

- Type phages for *S. typhi*
- Type phages for *Paratyphi B*

New Phage- based products

- FERSIS, SES, Entero, SPS - combined liquid preparations
- Mikolysis - mixture of phagolysate filtrates and anti-mycotic remedy

Coming:

- *Clostridium difficile* phage for use in medicine and veteinary
- *Hypoallergic* Staphphage for treatment infections in neonates
- Other

Eliava IBMV
Sustainability

- Basic state funding (Ministry of Education and Science)
- Grant support from various sources
  - Local (GNSF) and International
- Particular projects/contracts with government agencies, pharmaceutical and food companies etc
- Preparation and selling of small scale volumes of specific bio-preparations for experimental studies (medicine, veterinary, agriculture, environmental models etc)

International grants

- 1994-2005 – 30 International grants
- 1999-2005 - 10 International awards/stipends for young scientists (NATO, INTAS, DAAD etc)
- 7 - INTAS (open and thematic calls)
- 6 – ISTC (3- BTEP)
- 3 - STCU
- 7 - CRDF
- 1- DTRA/CBR programme (CRDF)
- 5 - NATO
- 2 - ISF and ISSEP (Soros foundation)

Total Grant Funding > 3,5 Million USD

Eliava Institute Today

- **National and International Contacts**

  (Universities, Research Institutes, Governmental agencies, companies)

  - Georgia and FSU countries

  - Europe

  - USA

  - Canada

- **Meetings, Conferences**

  International Phage Meeting (1997)

  NATO ARW anti-Bioterrorism (2004)

  Phage Conference –ISTC (2005)

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- By group of Dr. Gabisonia is created following phage preparations for human treatment:

Enkophage

Fersis

SES

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- **Enkophage (intestinal)**

Enkophage is a sterile filtrate of phage lysates of most spread salmonella serovars (S. typhimurium, S. enteritidis, S. heidelberg, S. newport, S. cholerae suis, S. oranienburg S. dublin and S. anatum) Shigella: (flexneri serovars 1,2, 3, 4 and sonnei 6) different serovars of enteropathogenic E.coli (O11, O55, O26, O125, O113, O 128, O18, O44, O25, O20) and three kinds of Staphylococci (S. aureus, S. epidermidis and S. saprophyticus)

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- **Fersis**

Fersis bacteriophage is a sterile filtrate of phage lysates of Staphylococci (S. aureus, S. epidermidis, and S. saprophyticus) and Streptococci (S. pyogenes, S. sanguis, S. salivarius and S. agalactiae)

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- **SES**

SES bacteriophage is a sterile filtrate of phage lysates of Staphylococci (S. aureus, S. epidermidis, and S. saprophyticus); Streptococci (S. pyogenes, S. sanguis, S. salivarius and S. agalactiae) and different serovars of enteropathogenic E.coli (O11, O55, O26, O125, O113, O 128, O18, O44, O25, O20)

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- By group of Dr. Gabisonia also is created phage preparation for animal treatment (project BTEP 84 – ISTC G-1009, Collaborators Dr. K.Severinov and Dr. I. Molineoux

Mastiphage – TK

Mastiphage is a sterile filtrate of phage lysates of Staphylococci (S. aureus and S. epidermidis), Streptococci (S. pyogenes and S. agalactiae) and random serovars of E.coli.

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Mastiphage – TK

Injection of phage preparation in udder

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Dr. M. Tediashvili

Dr. K. Severinov and
Dr. T. Gabisonia

Dr. M. Loladze

Eliava Institute Today

The science group of
Dr. T. Gabisonia