

# Biobank of microorganisms causing emerging, transboundary, epizootic and exotic animal diseases

Egorova I.Y., Balyshev V.M., Selyaninov Y.O., Malogolovkin A.S., Kolbasov D.V.

Microbiological Biobanking is on the top priority challenge of scientific research. The main tasks of biobanking are depositing, storage and rational use of pathogen biodiversity in human and animal infectious diseases.

For the solution of applied research tasks and in particular in the field of biosecurity of the Russian Federation, according to National Government Regulation on the base of National Research Institute for Veterinary Virology and Microbiology of Russia (VNIIVVM, currently Federal Research Center for Virology and Microbiology (FRCVM) a biobank of microorganisms causing emerging, transboundary and exotic animal diseases was established. In 2011, according to RF Government Regulation, biobank had been assigned a status of National biobank.

National biobank works on the base of museum complex of FRCVM including strain biobank, laboratory buildings, and animal facilities, equipped with special infrastructure, which are necessary for biological safety when work with BSL3-BSL4 pathogens is carried out.

The main foci of biobank:

- depositing of pathogens of notified, emerging and exotic animal diseases including agents obtained following experimental research and isolated from man-made and natural ecosystems;
- storing in active state the objects of strain biobank of bacterial, mycoplasmal and viral etiology;
- studying the biological features of agent strains of animal infectious diseases including common for human and animal – main identification characteristics, antigenicity, protection potential, immunological propriety of applying vaccine strains and etc.;
- maintenance of strains dedicated for producing biopharmaceuticals and diagnostics kits for animal infectious diseases;
- providing to national diagnostic and pharmaceutical laboratories with testing culture of microorganisms, which are necessary for quality control of culture media, cell culture, validation and verification of diagnostic assays, staff training;
- producing of control samples on the base of biological (pathogenic) specimen of animal origin, infected with animal pathogens of animal infectious diseases for the staff competence verification and quality assessment of diagnostic assays;
- staff training in the field of biobanking activity.

Nowadays strain biobank has more than 2300 strains of notified, emerging and exotic pathogens of animal diseases of 140 nosological entity. The most valuable are *Bacillus anthracis*, Classical Swine Fever Virus, African Swine Fever Virus, Rift Valley fever, Bluetongue, Sheep and Goat Pox, Peste des petits ruminants, rabies, listeriosis, mycoplasmosis of livestock animals. Strain biobank has more than 60 viral and bacterial strains for vaccine production and also candidate strains with a potential for development of diagnostic tools and specific prophylaxis.

Microbiological sampling for the biobank was carried out due to monitoring and diagnostic research from the establishing the Organization and continues at the present time. Over the last ten years within the framework of accomplishment the Government Resolution from September 20th 2016 No 2048-p, National biobank has obtained strains of African Swine Fever, circulating in the territory of the Russian Federation that caused outbreaks of the disease in pig breeding farms of different properties and in wild fauna. In 2016 strains of *Bacillus anthracis* which caused the outbreaks of Anthrax in Yamal-Nenets autonomous district (after 75 years of endemic free period) were deposited the in National biobank.

The stocks of National biobank of microorganisms are regularly used for carrying out fundamental and applied scientific research, also grants of RSF, RFBR and Grants of the President of the Russian Federation, international projects, control of circulation and adaptation of pathogens of transmissible diseases and changing environmental conditions, when developing medical, diagnostic and preventive drugs. Forty-five objects of biobank have formed the basis of patents for developments of studying the pathogenesis of animal infectious diseases, diagnostic tools, and preventive measures.

In 2016-2017 with financial support of FASO of Russia of National biobank of microorganisms, within the framework of additional State project we have generated important results summarized in an article/report entitled «Depositing and storage of microorganisms, studying biological properties of bacterial and viral pathogens», codes: №0615-2016-0001, 0615-2017-0002. Within the framework of this topic we have obtained these main results:

- We determined a genotype and genetic markers of evolutionary variability of ASFV strains, extracted in the territory of the Russian Federation in 2016-2017. The clusters of genetic variant of ASFV localization were defined.
- On the basis of studying molecular-genetic and biological characteristics we carried out an epizootic passportization of *Bacillus anthracis*, caused an outbreak in Volgograd Region and an epizooty among reindeers in Yamal-Nenets district in 2016. We identified genetic clusterization of strains using geographic origin.
- We developed a technological certificate of biobank including a list of SOP, summing up an order of maintaining the biobank in active status and deposition of microorganisms strains.

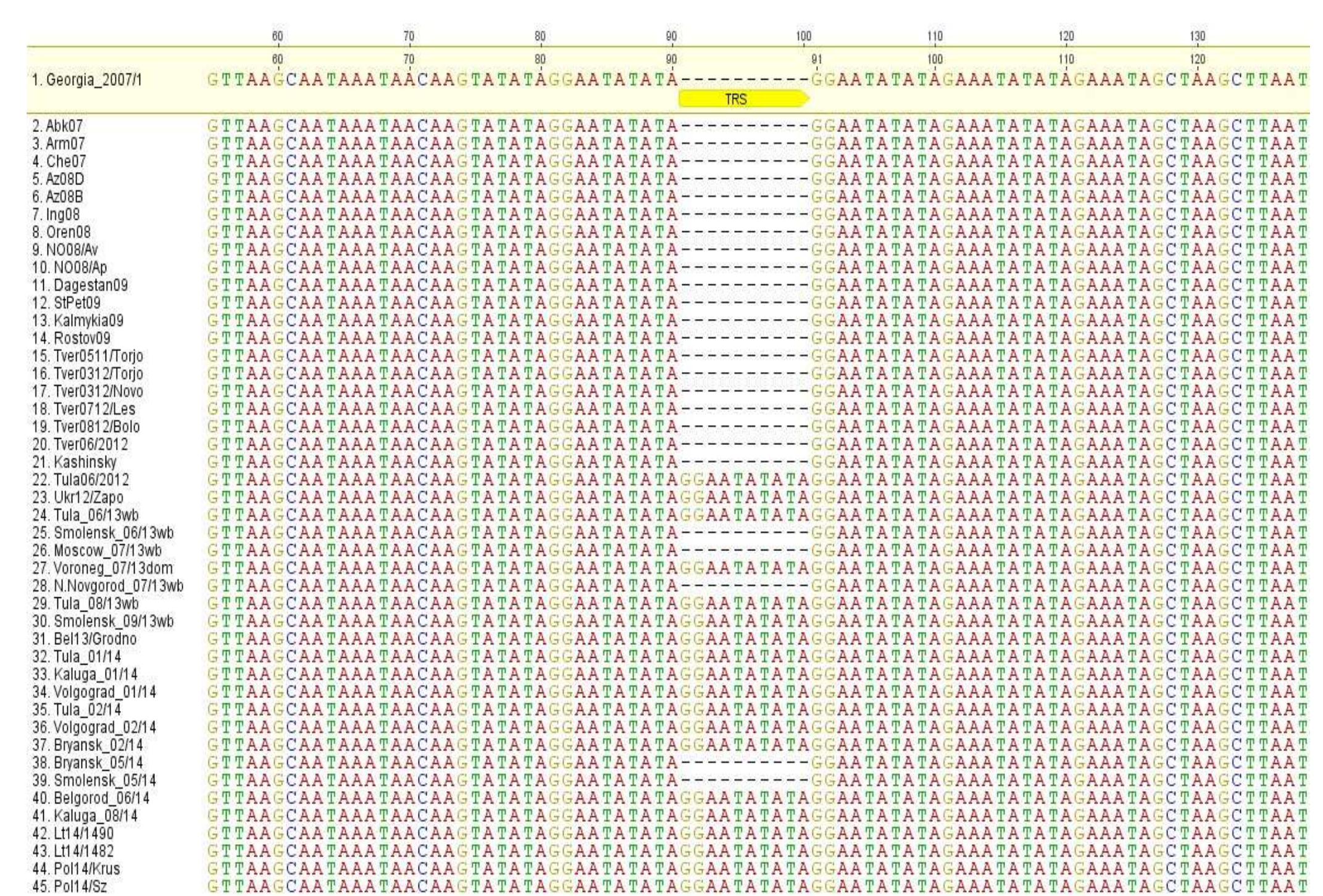
The basis of the prospects for further development is composed of updating of biobank stocks, implementation of new technologies and methods in biobanking with the use of pathogenic and biological agents, standardization of methods of biological research and procedures of official strain deposit and completing the biobank with the help of high-skilled staff.



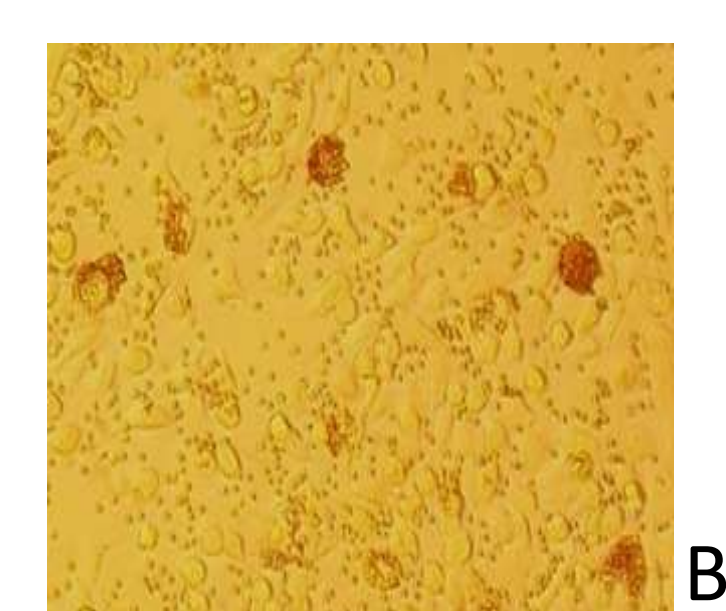
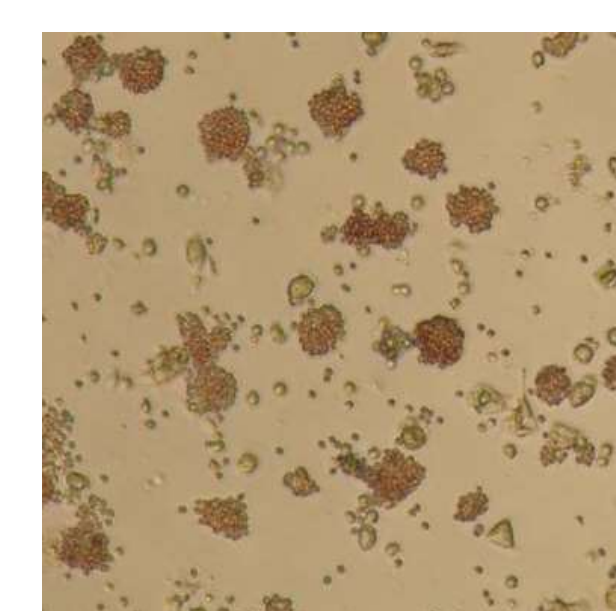
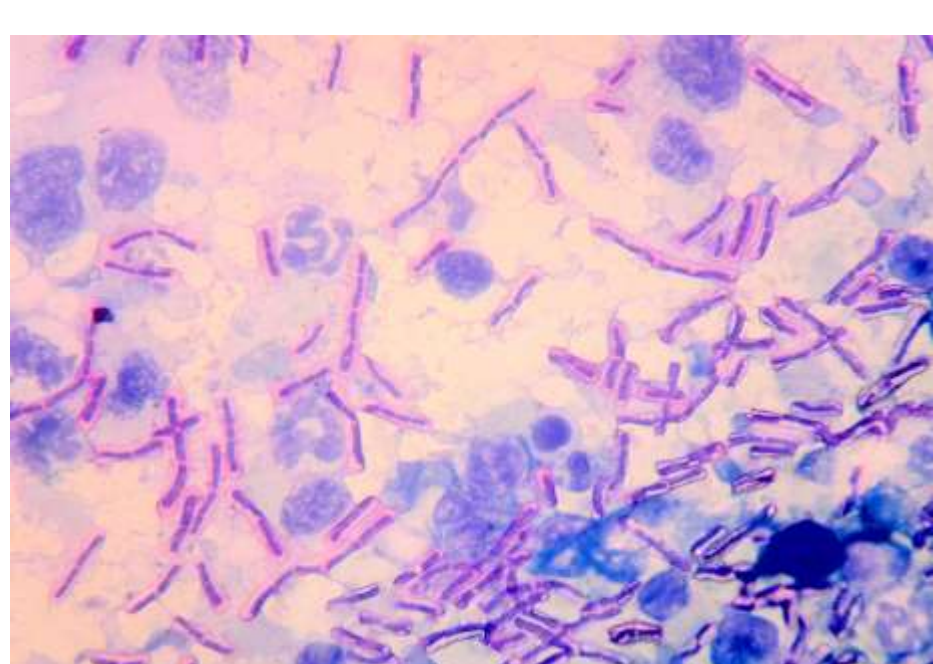
Genetic passportization of microorganisms



Biological characteristic of microorganisms



Scheme for the analysis of nucleotide sequences of the intergenic region 173R / I329L of isolates of the ASF virus and reference strains from the international GenBank database



The cultural-morphological, biochemical and diagnostic properties of *Bacillus anthracis* isolates

Hemadsorption in infected with ASF virus cultures of LS and A4C2 / 9k cells