



Anthrax in reindeer population in Yamal Nenets Autonomous District

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Administrative divisions of Yamal-Nenets Autonomous District

7 administrative districts (Priuralsky, Shuryksharsky, Yamal, Tazovsky, Purovsky, Nadym, Krasnoselkupsky),

geographically separated by

- the Gulf of Ob;
 - the northern part of the Ural Mountains,
- natural barriers for spreading of infectious animal diseases.





Reindeer herding in Yamal Nenets Autonomous District

- The number of domestic reindeer population in all the categories of farms was 733.372 (on 01.01.2016), the wild reindeer– 1500 species (14.06.2018).
- More than a half of domestic reindeer 372.200 is in the ownership of rurals.
 - Reindeer herding is well-developed in the district, 15.000 citizens are involved in it, most of belongs to the indigenous minorities.
 - Currently in Yamal the reindeer population is increased by 2.5 times for allowed pasture capacity and because of that there's a lack of reindeer food supply (fodder grass, reindeer moss, mushrooms, berries) (Zuev S.M., Russia in the global world № 9 (32) 2016).



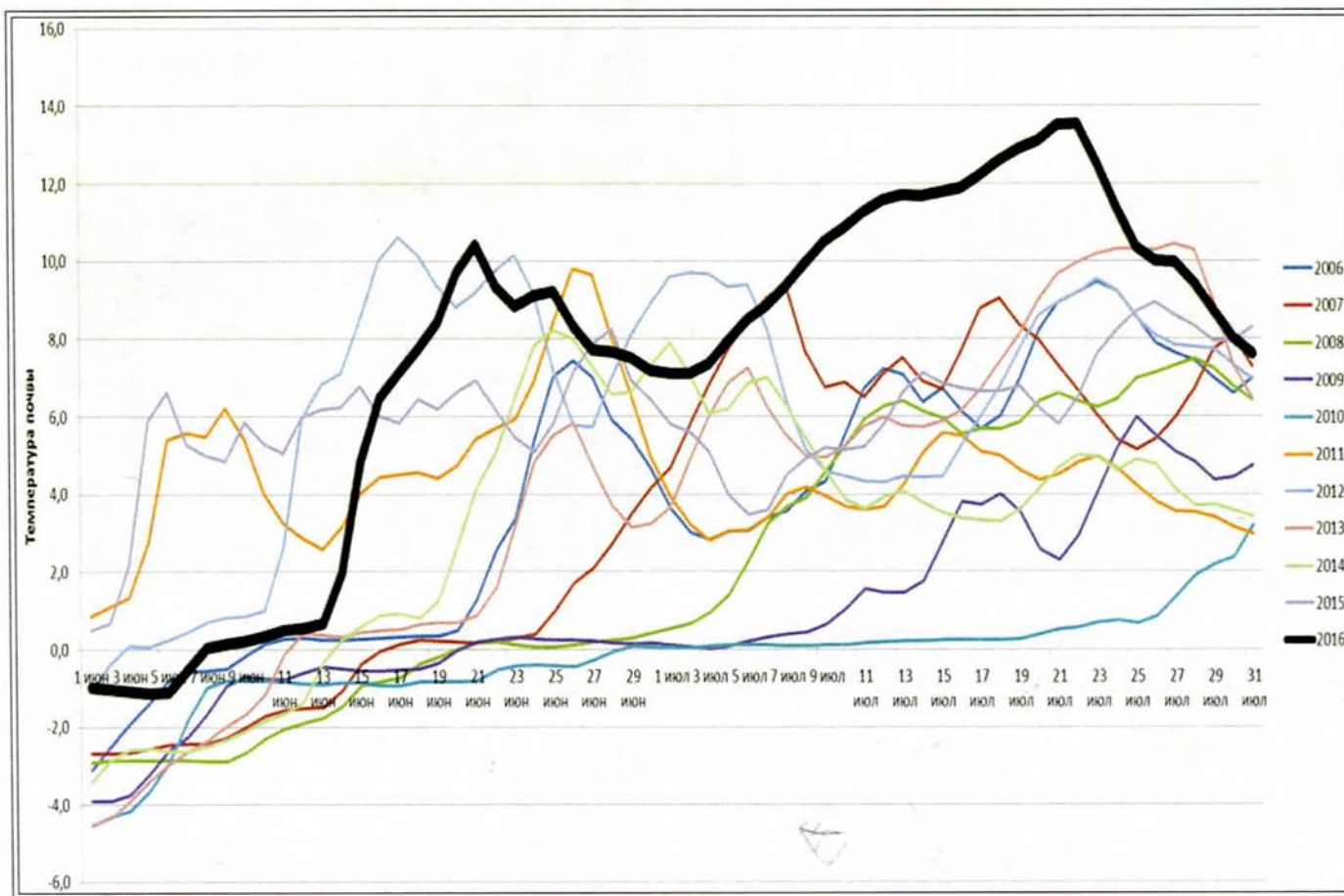


- The main deer population is inhabited in the tundra and forest-tundra of the Yamal-Nenets Autonomous District (Yamal, Priuralsky and Tazovsky districts), in which the transport infrastructure is not developed.
- In the Yamal district, the number of deer in 2013 exceeded the estimated reindeer pasture capacity by 176.000 heads, in the Tazovsky district - by 94.000 heads, in the Priuralsky district - by 76.000 heads.
- In general, the increase in the number of domesticated reindeer population is associated with financial governmental support for reindeer herding.
- The main natural causes of mortality in the reindeer population is malnutrition, as in the autumn-winter period in 1999 about 20.000 heads of deer died from it, and from 2013 to 2014 – 90.000 heads. The main cause of death is the formation of ice on the snow cover due to abnormally warm winter.



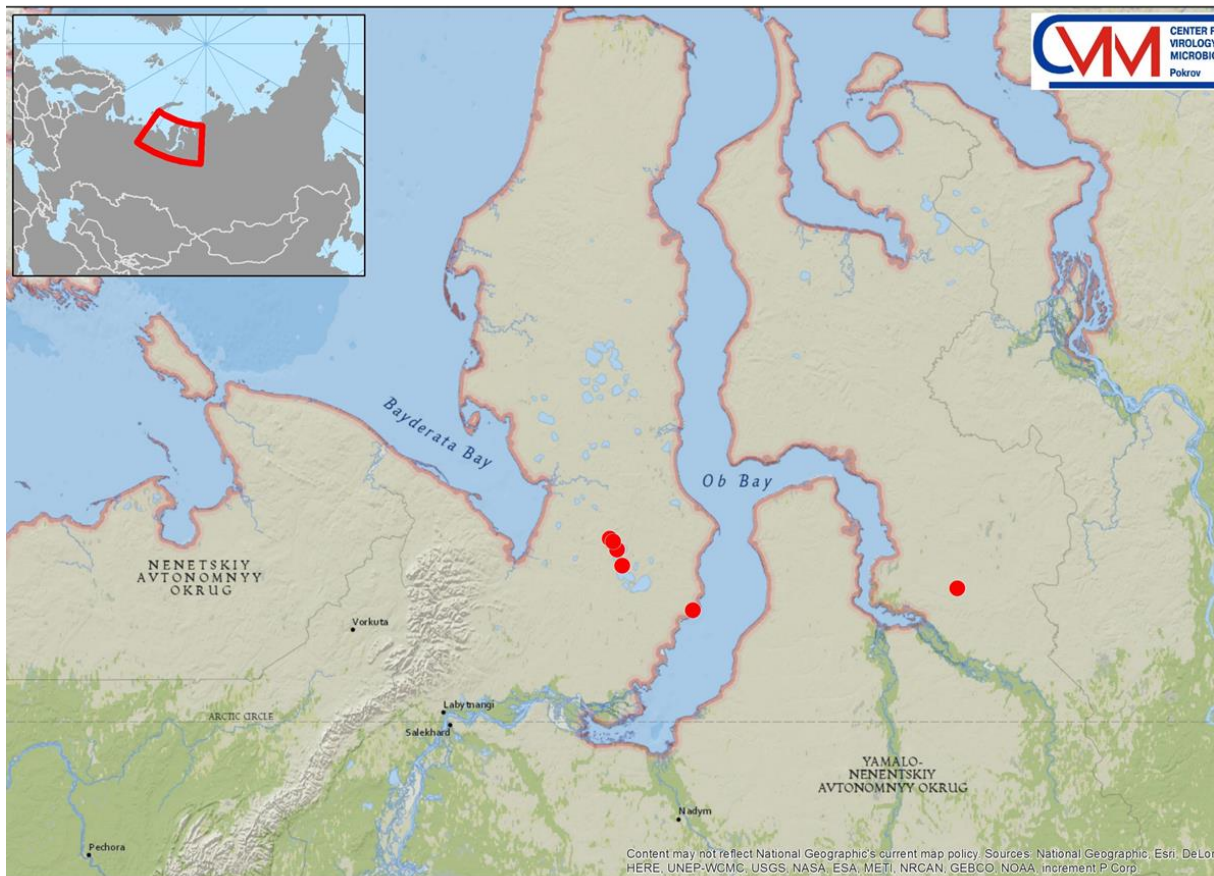


Soil temperature at the Yamal Peninsula in June and July of 2000-2016





In 2016 six outbreaks of Anthrax were notified in a reindeer population in 2 districts of the territory of Yamal-Nenets Autonomous District, in which 2657 reindeer died.





Anthrax on animals in 2016-2018





Epizootic of anthrax in the Yamal-Nenets Autonomous District

The first mortality cases of deer deaths were observed in July 2016, by the middle of July 60 heads were dead. After the reindeer movement, the daily mortality cases were about 20 heads per day.

On July 20, 2016, samples collected from the fallen reindeer belonging to the private reindeer herder Salinder G.D., submitted to the Tyumen Regional Veterinary Laboratory, samples were positive confirmed on July 25, 2016.

July 24, 2016 selected samples were additionally sent to the Federal Research Center for Virology and Microbiology in Pokrov. Samples were positively confirmed on July 25, 2016.





Epizootic of anthrax in the Yamal-Nenets Autonomous District

- On July 25, 2016 request on quarantine in the reindeer herding territory of private reindeer husbandry in the area of Lake Pisyot in the Yamal district was sent to the Governor of the Yamal-Nenets Autonomous District.
- On July 25, 2016, the decree of the Governor of Yamal-Nenets Autonomous District No. 181-R "On the establishment of restrictive measures (quarantine) in the territory of grazing of reindeer belonging to private reindeer husbandry in the area of Lake Pisoto in the Yamal district" was signed and the Veterinary Service prepared a Emergency plan for anthrax outbreak control and eradication.



Clinical signs of anthrax in the field



Animals were weak, separated from the herd.
White (pink) oral and nasal discharge.
Corpses of fallen animals was well-fed.
Lack of external skin damage.
Lack of ulcers, erosion on visible mucous membranes.



Statistical data of animals dead from anthrax

| | |
|-----------------------|-----|
| Male reindeer (bucks) | 50% |
| Female reindeer (cow) | 40% |
| reindeer fawns | 10% |

A peculiarity of this outbreak was the involvement of Lappish reindeer dogs in the epizootic process, from which we isolated pure bacteria culture.





Potential risk factors for anthrax spreading

- Considering late diagnosis of anthrax, in the period from July to August 2016 reindeer antlers were actively collected for their subsequent processing into food additives and medicines
- According to the Federal Security Service during the outbreak cases of cutting antlers from corpses of reindeer fallen from anthrax occurred.





Risks in the spreading of anthrax with raw materials of antlers

- Absence of veterinary control in the preparation of antlers.
- A large number of people involved in the collection, transportation and handling of antlers.
- Numerous illegal storage and artisanal drying points for antlers located on private farms, in garages and other objects within the boundaries of residential development.
- Shipping of antlers by food transports.

In 2017, in the Komi Republic, a batch of antlers over 5 tons was confiscated because of suspicion of its contamination with *Bacillus anthracis*, and it was destroyed.





Factors associated with the emergence of Anthrax epizootic in the Yamal-Nenets Autonomous District

- The absence of vaccination of reindeer against anthrax in the territory of Yamal from 2007.
- In 6 districts of the Yamal-Nenets Autonomous District, 59 "burial places" (dead fields) potentially contaminated by anthrax were registered, including 10 in the Yamal District were not defined before the outbreak.
- Hot weather in June 2016 (above 30 degree Celsius).
- Lack of communication tools in the territory of the Yamal district.



Changes in legislation after the outbreak

- Taking into account the situation of anthrax epizootic, it was suggested to make a number of changes in federal regulation.
- For example, “burial places” - the territory where the death of animals was noted, without clear boundaries of burial.
- The territory of “burial places” is marked on maps and is considered a threatened territory.



Characteristics of *B. anthracis* strains, isolated during the Anthrax outbreaks in the Yamal

- All the strains produced capsule and toxin, produced hemolytic and proteolytic activity, protocatechuic acid, and had a high virulence for laboratory mice in doses with 6-1000 spores.
- All the strains had a natural resistance to Polymyxyn B, were sensitive to Levomycetin, Kanamycinum, Penicillin, Tylosin, Streptomycin, Neomycinum, Tetracyclinum, Ampicillinum, and Enrofloxacinum.

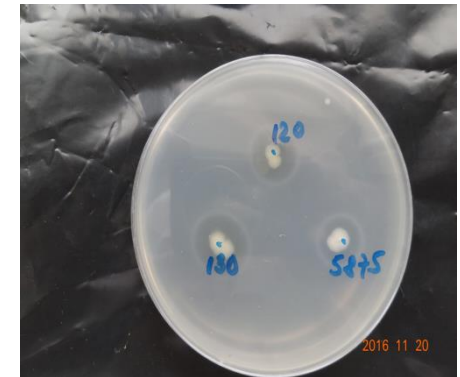
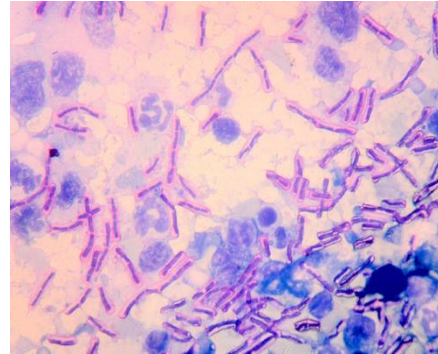


Figure 1 - The cultural-morphological (A – capsule products), biochemical (B - proteolytic activity) and diagnostic properties (C - hemolytic activity) of *Bacillus anthracis* strains.



Characteristics of *B. anthracis* strains, isolated during the Anthrax outbreaks in the Yamal

The most significant phenotypic and molecular-genetic differences were found in asporogenous and avirulent strain *B. anthracis* isolated from a Lappish reindeer dog in Yamal. Strains isolated during one outbreak were grouped into separate clusters, and within the cluster some strains had insignificant differences in 1-2 loci.

The results show that the morbidity of the disease depends on the geographic location of Anthrax in the territory of Russian Federation and most of the isolated strains have typical characteristics of *Bacillus anthracis*.

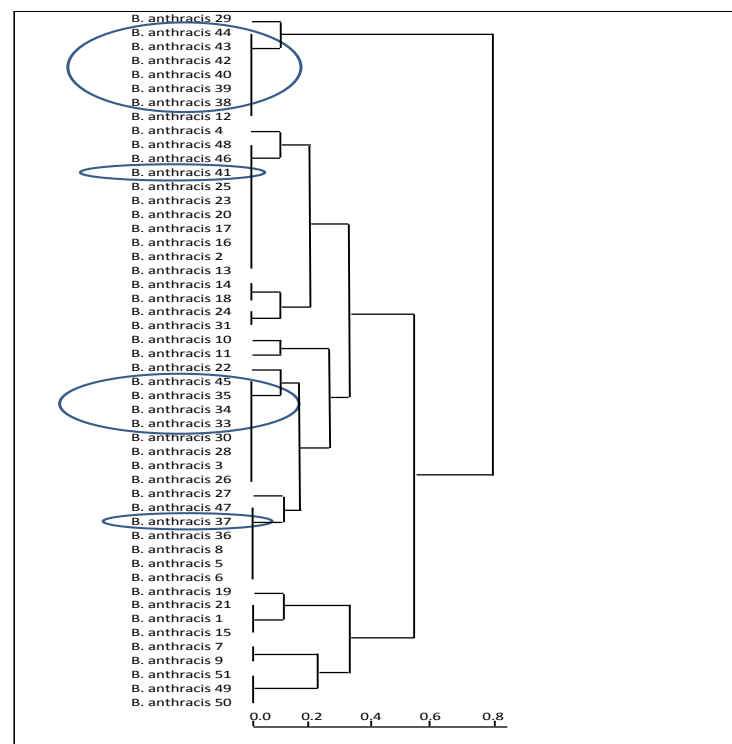


Figure 2 - Clustering analysis in 50 strains and isolates (MLVA-20), genotypes 1 to 4 for the studied strains. The column contains data on the identification of strains. The numbers on the left I-IV are the genotypes of the strains *B. anthracis* (MLVA 20) isolated from 2014 to 2016.



Measures for the outbreak eradication

- Definition of control zone.
- Designing of the vaccination plan and emergency vaccination for reindeer in the outbreak.
- Identification of transhumance routes and ways to remove vaccinated animals and humans to a safe area.
- Calculation of the additional veterinary specialists needed for eradication of the outbreak.
- Designing of a disinfection plan.
- Destroying of 2,485 carcasses of reindeer by incineration with subsequent disinfection of the area.



Measures for eradication of the outbreak

- Identification of storage sites for reindeer products confiscated from people in the quarantine zone.
- Export ban on reindeer products from the Yamal region.
- Daily epizootological data collection (number and places of new foci).
- Vaccination and antibiotic treatment for people who are at risk because of working in an epizootic outbreak.
- Providing government financial support to compensate losses of the reindeer-breeders.
- Data collection and mapping burial places on the territory of Yamal District.
- Laboratory monitoring of environment (feed, soil, water).



Agencies that participated in the eradication of the outbreak of anthrax in the YAND

- Ministry of Agriculture of Russia;
- Federal Service for Veterinary and Phytosanitary Surveillance;
- Federal Service on Customers Rights Protection and Human Well-being Surveillance;
- Ministry of Health of Russia;
- Russian Emergency Ministry;
- The Ministry of Defense of Russia;
- Federal Agency for Scientific Organizations.



- **Thank you for**
- **attention!**

