



**NATIONAL ACADEMY OF AGRARIAN
SCIENCE OF UKRAINE
National Scientific Center**



“Institute for Experimental and Clinical Veterinary Medicine”

Current epizootology of TB and its eradication in Ukraine

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NSC “Institute of Experimental and Clinical Veterinary Medicine”



➤ **The oldest in Ukraine
Institute of Experimental and
Clinical Veterinary medicine
was founded in 1923 by special
decision of the Government.**



- Since its foundation Institute worked on such problems as malleus, anthrax, brucellosis, plague, classical swine fever, foot-and-mouth disease, stachyobotryotoxicosis and others.

The main activities of NSC “Institute of Experimental and Clinical Veterinary Medicine”



- Scientific activities (Наукова діяльність).
- Reference activities (Діяльність в межах референс-експертизи).
- Field and consulting activities (Господарчо-договірна та консалтингова діяльність).
- Educational activities (Освітня діяльність).



Place of NSC “Institute of Experimental and Clinical Veterinary Medicine” in veterinary establishments network of Ukraine



State Veterinary and Phytosanitary Service Державна ветеринарна та фітосанітарна служба України

State institute for lab. diagn. and
veterinary expertise

State control institute
for biotechnology and
microbial strains

State scientific-
research control
institute for vet. drugs
and feed supplements

National Academy of Agrarian Sciences of Ukraine

Національна Академія аграрних
наук України

NSC IECVM

IVM NAASU



Pathogen and cell cultures repository in National Scientific Center “Institute of Experimental and Clinical Veterinary Medicine”

The unique collections of the pathogenic microorganism strains and cell cultures are created and maintaining in NSC IECVM (Kharkiv) for scientific research and development of biopreparations.

They got status of the National treasure under the governmental decision

- ✓ Collection of the microorganisms strains (750 strains of the viruses and bacteria, including the avian influenza virus, virus of the Newcastle disease, classical swine fever, Aujeszky disease, brucellas, mycobacteria and salmonellas etc)
- ✓ Cell cultures for veterinary medicine and biotechnology (over 40 mammal and avian cell lines)

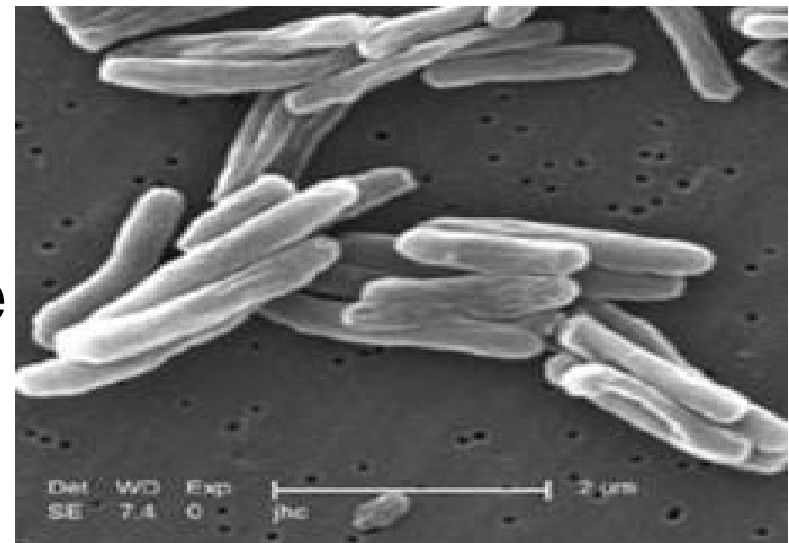


Tuberculosis –

is an infectious disease of animals and humans, characterized by the formation a typical nodule (tuberculoma) in organs and tissues.

In most cases, the disease is latent and chronic. Antiepzootic measures carried out in conditions of panzootic bovine tuberculosis worldwide and human tuberculosis epidemics in Ukraine.

Tuberculosis could be classified as emergent infectious diseases, that is especially dangerous and unexpected because of its agent multiresistant forms occurrence.



According to OIE (2010) and WHO (2006), there are three types of *Mycobacterium tuberculosis*:

- *Mycobacterium bovis* (bovine tuberculosis is potentially a high risk of infection with other animals and humans);
- *Mycobacterium avium* (causes tuberculosis in poultry, pigs mycobacterioses, there is a risk of human infection);
- *Mycobacterium tuberculosis* (causes tuberculosis in humans and is potentially risks for cattle).

Mycobacterium tuberculosis exhibit high resistance to negative environmental factors and actions of disinfectants, alcohol and acid.



The viability of mycobacteria in the environment :

- Soil - 17 - 18 months;
- Frozen soil - 27 - 36 months;
- Swamp water - 12 months;
- River water - 7 months;
- Distilled water - 321 day;
- Tap water - 160 days;
- Dung- 5 - 7 months;
- Urine - 107 days.



The viability of mycobacteria in feed and animal products:

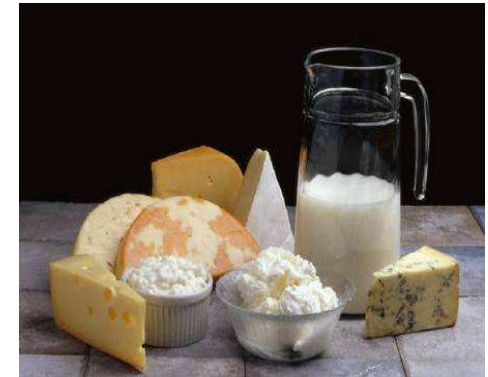


In the feed:

- Barley - 983 days;
- Peas - 976 days;
- Wheat - 972 days;
- Mixed fodder - 793 days.

In food products:

- Oil - 300 days;
- Cheese - 260 days;
- Milk - 14 - 18 days



Human tuberculosis

- Today it has spread to all continents of the world, especially in developing countries.

Risk groups:

- Livestock workers;
- Doctors and service personnel of TB institutions;
- The least socio-secured groups;
- People with immunosuppressive conditions.

The main problem in the fight against tuberculosis in humane medicine is the appearance of the *Mycobacteria* antibiotic-resistant forms.

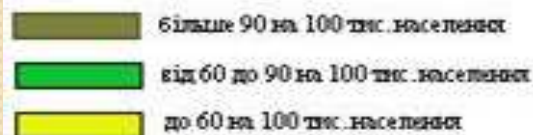




The epidemic situation of tuberculosis in Ukraine (МОН, 2014)



Україна 84,1 на 100 тис. населення



Tuberculosis cases in Europe (2014)

Минимум

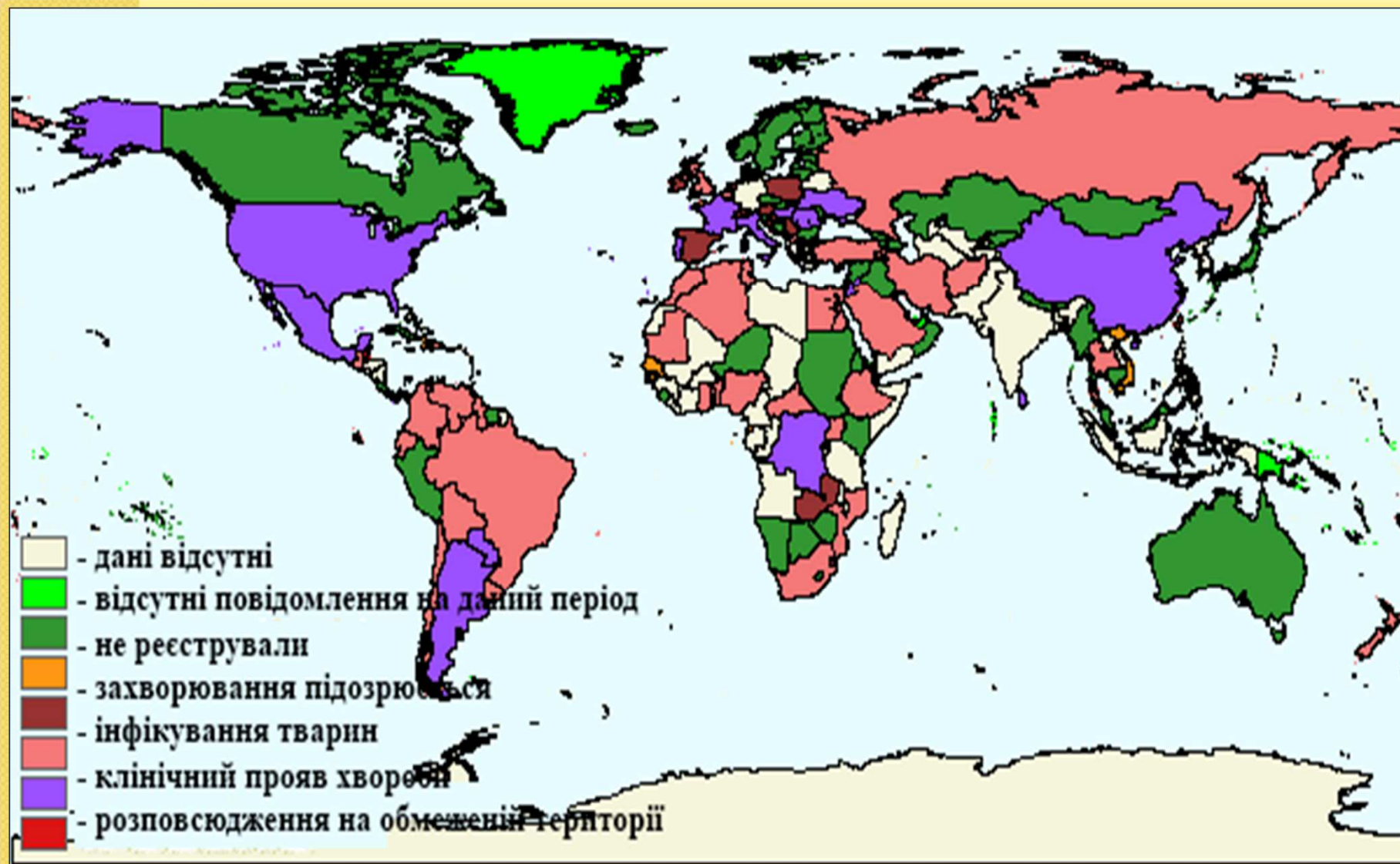
	Испания	3,8
	Кипр	4,1
	Мальта	4,5
	Швейцария	4,6
	Греция	6
	Норвегия	6,1
	Финляндия	6,1

Максимум

	Молдова	122
	Румыния	120
	Грузия	101
	Россия	89



Epizootic situation with bovine tuberculosis in the world (2013-2014)



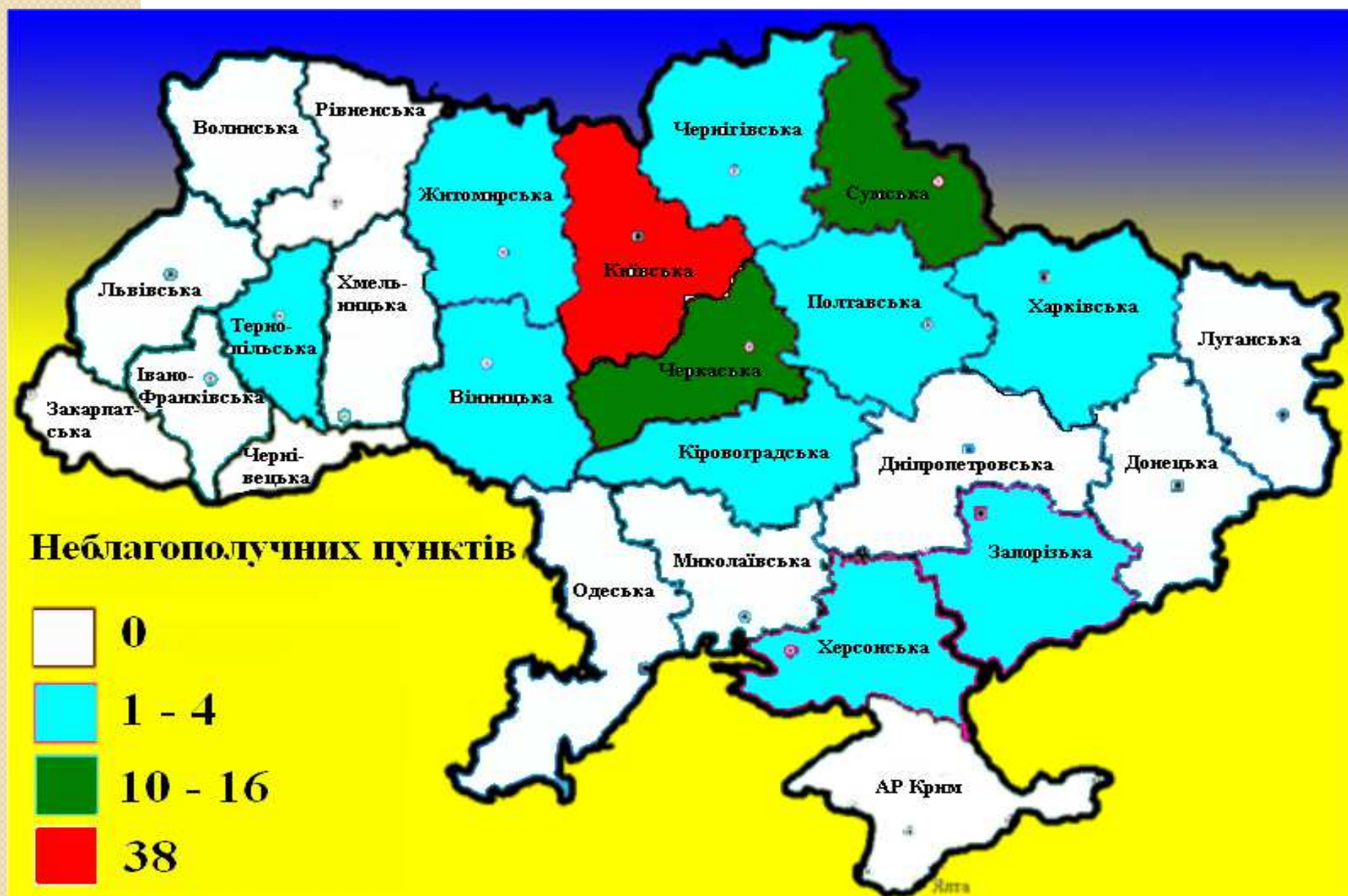


Epizootological monitoring for tuberculosis in animals in the EU are provided by:

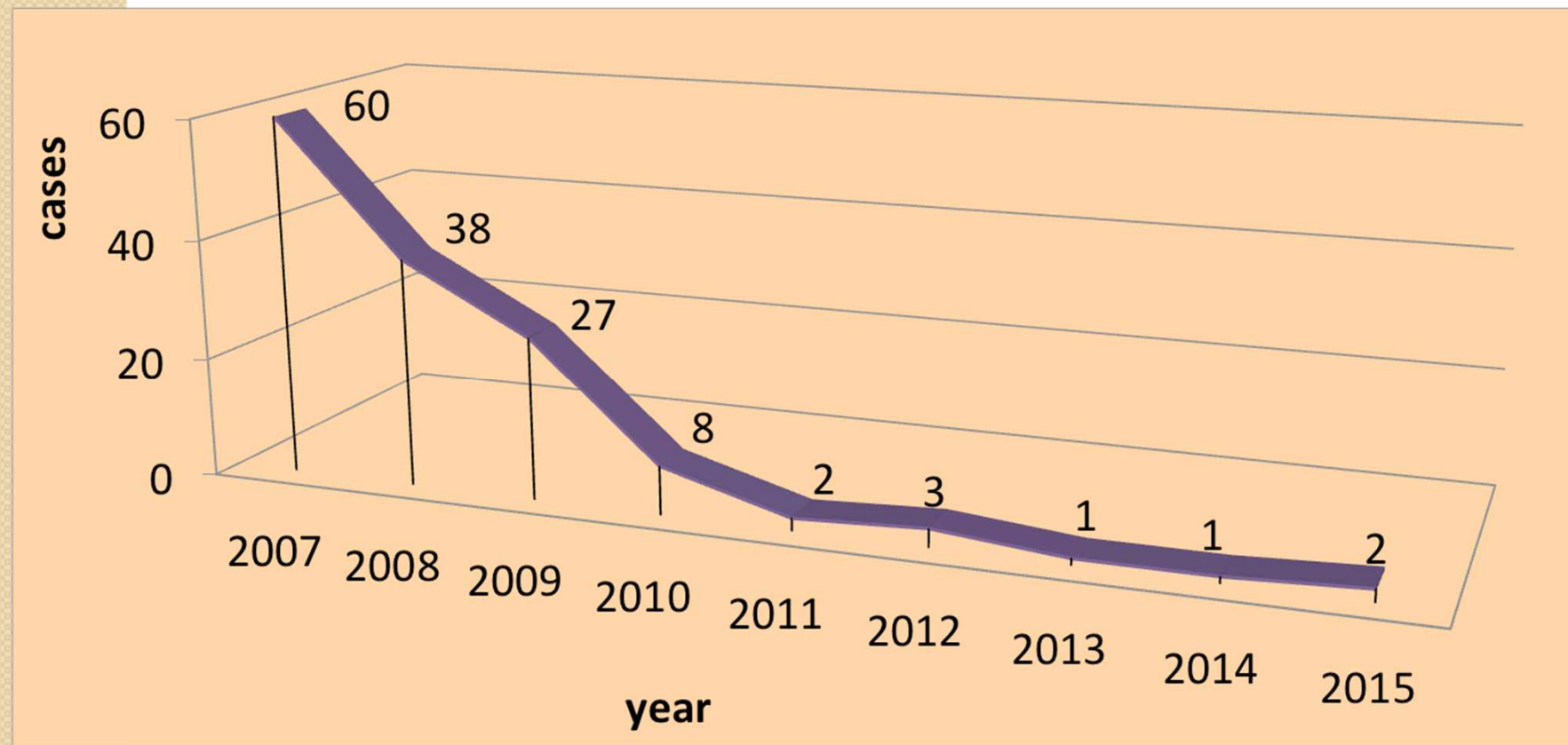
- The network of regional diagnostic laboratories;
- National Reference Centre for tuberculosis control;
- EU reference laboratory, WHO, FAO, OIE.

Regulatory and legal framework for tuberculosis monitoring in the EU is a national program and the relevant European Union directives (64/432 / EEC 90/425 EC, 92/46 / EC, 77/591 / EC, 64/433 EEC).

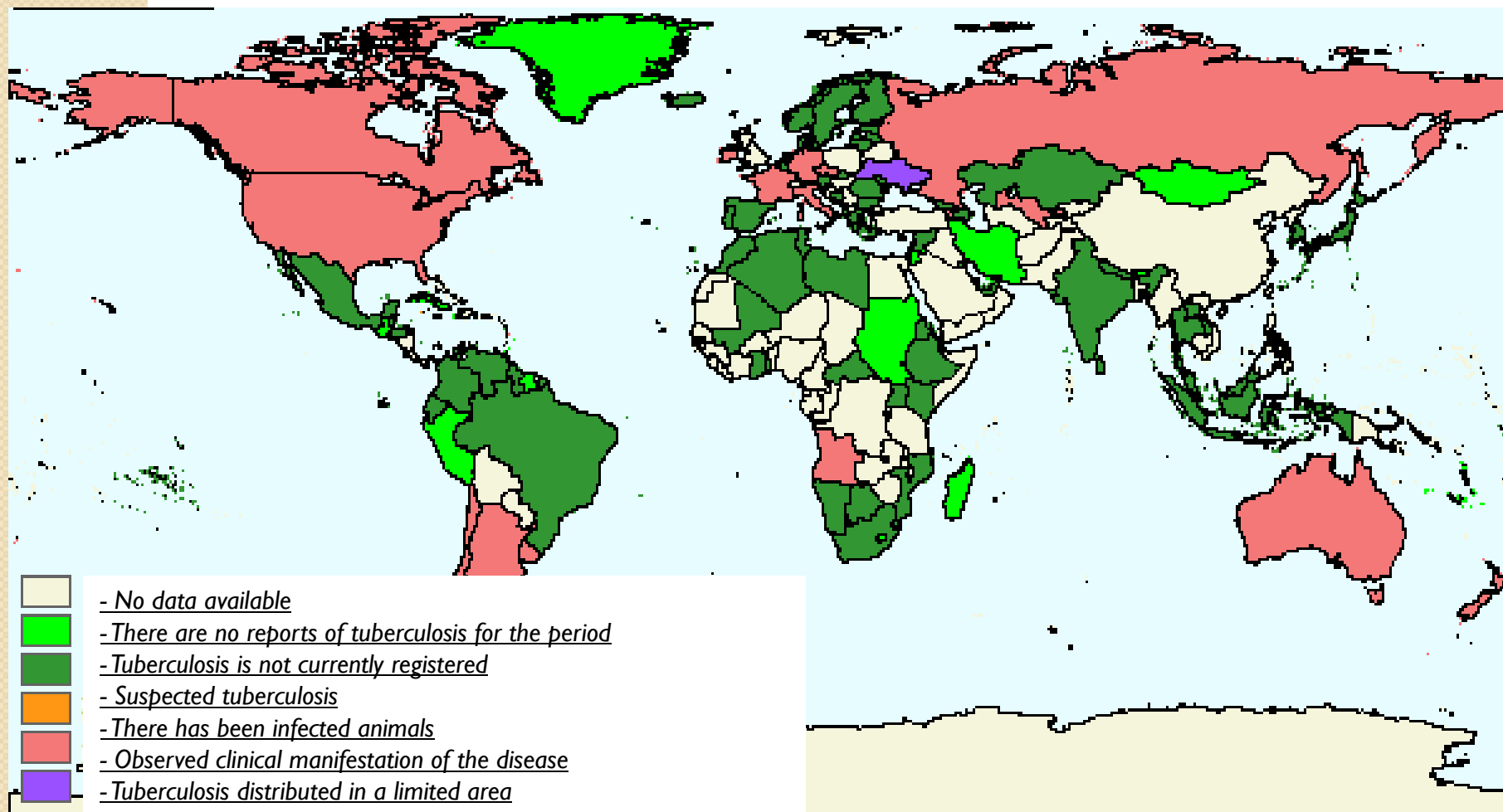
Epizootic situation with bovine tuberculosis in Ukraine (2007-2014)



Dynamics detection of disadvantaged points of bovine tuberculosis in Ukraine



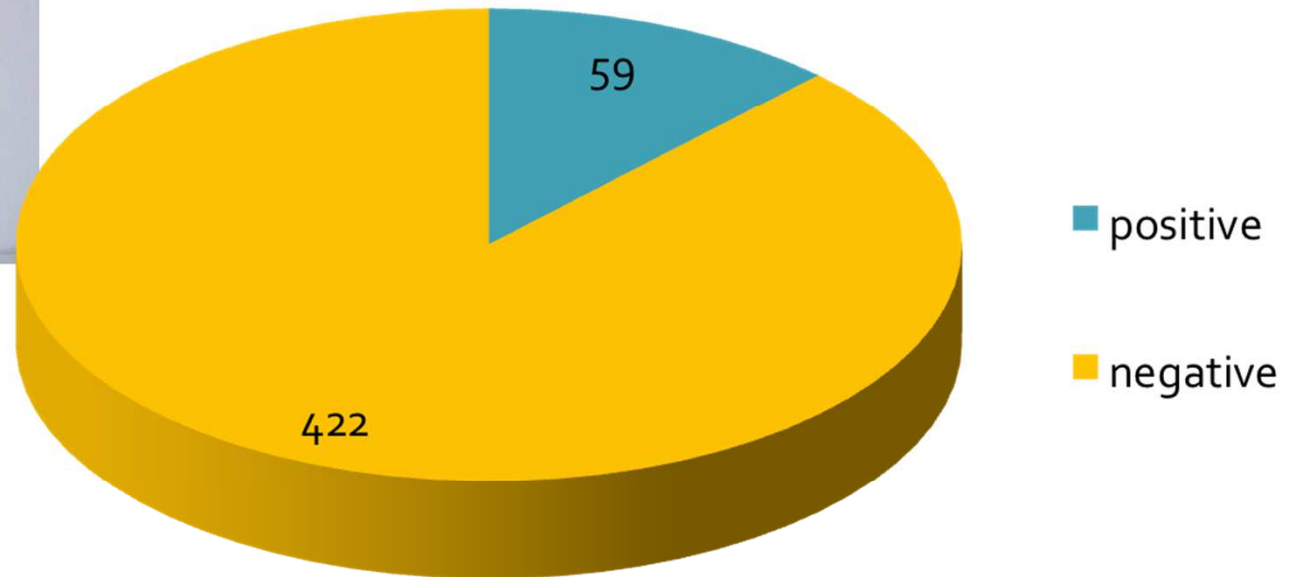
Epizootic situation in the world for avian tuberculosis (according to OIE, 2014)



According to OIE reports avian tuberculosis was widespread in the world before 2005. Avian tuberculosis in Ukraine recently recorded in some regions (Kharkiv, Luhansk, Dnipropetrovs'k, Cherkassy).



The results of allergic gardens and farms poultry research for tuberculosis of the Eastern region of Ukraine (according to NSC "IECVM", 2014)



According allergic testing in private households of citizens established *M. avium* circulation among 10-15% of poultry older than 3 years.

The regulatory and legal framework for tuberculosis of animals in Ukraine

- The Law of Ukraine "On veterinary medicine";
- The Law of Ukraine "On struggle against tuberculosis";
- The Law of Ukraine "On ensuring sanitary and epidemiological welfare";
- "Instructions on prevention and control of animals tuberculosis";
- "Guidelines for the diagnosis of animals and avian tuberculosis";
- Other guidelines.



The main methods of tuberculosis in animals control is primarily lifetime diagnostic tests:

I. Allergic tests:

intradermal tuberculin test (recommended method), and with it:

- Simultaneous allergic test;
- Ophthalmic test;
- Intravenous tuberculin test.

II. Serological and hematological tests:

- Gamma Interferon test (tuberculin tests alternative method);
- lymphocyte proliferation reaction;
- ELISA.

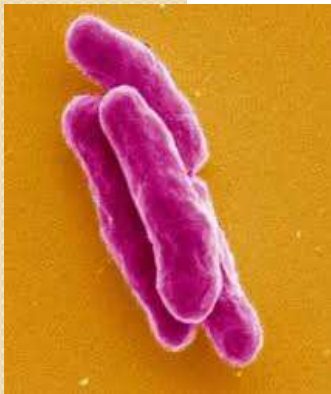




For the diagnosis of tuberculosis in animal according to the OIE use:

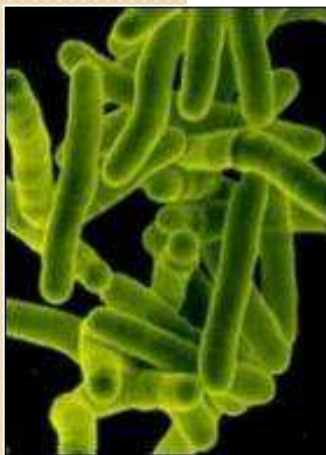
Methods of clinical and pathoanatomical diagnostics:

- clinical examination;
- histological method;
- pathological study.



Methods for agent isolation and identification:

- bacteriological studies (isolation and cultivation of pathogens, morphology, microscopy, biochemistry);
- PCR for the detection and identification of mycobacterial DNA;
- biological sample.





Scientific and methodological support antiepzootic measures for tuberculosis in Ukraine is carried out within the sector of scientific and technical programs NAAS of Ukraine "Scientific support epizootic welfare, bio-security, animal health and the veterinary and sanitary quality of animal products" (Biological safety and animal health) – Prof., ScD, Academician of NAAS

Stegnyy B.T.

Task 32.01 - Explore ecogeographical, immunological, molecular-genetic and evolutionary characteristics of different species of mycobacteria Science Lead – Prof., ScD, Corresponding Member of NAAS

Zavgorodniy A.I.



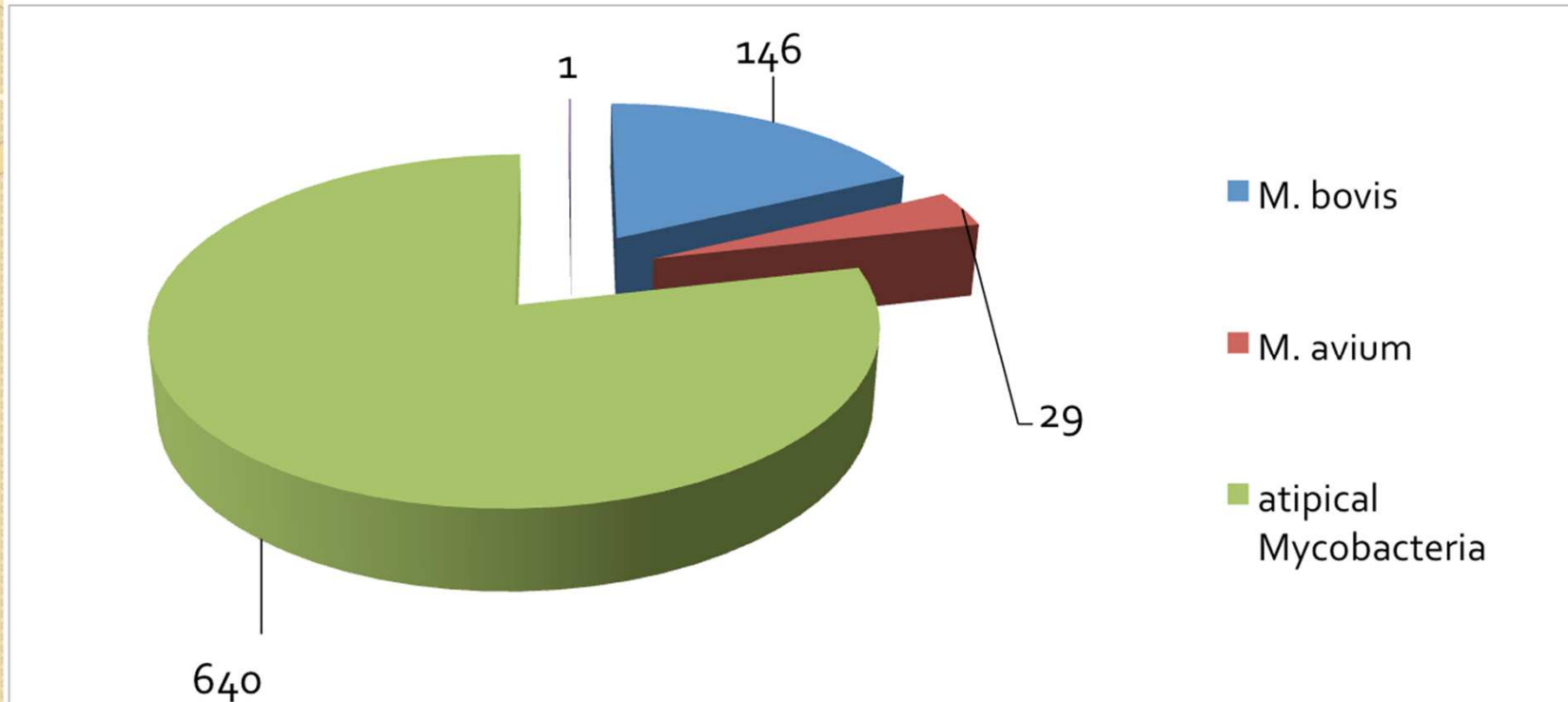


In 2005 at the NSC "IECVM" by joint order of the NAAS President and the Head of the State Committee of Veterinary Medicine in Ukraine was established the **Scientific and Production Center for the Study of animals tuberculosis, which coordinates research on monitoring epizootic tuberculosis of animals in Ukraine, is developing a monitoring system, prognosis, diagnosis and prevention, introducing modern methods of livestock rehabilitation of tuberculosis in animals.**





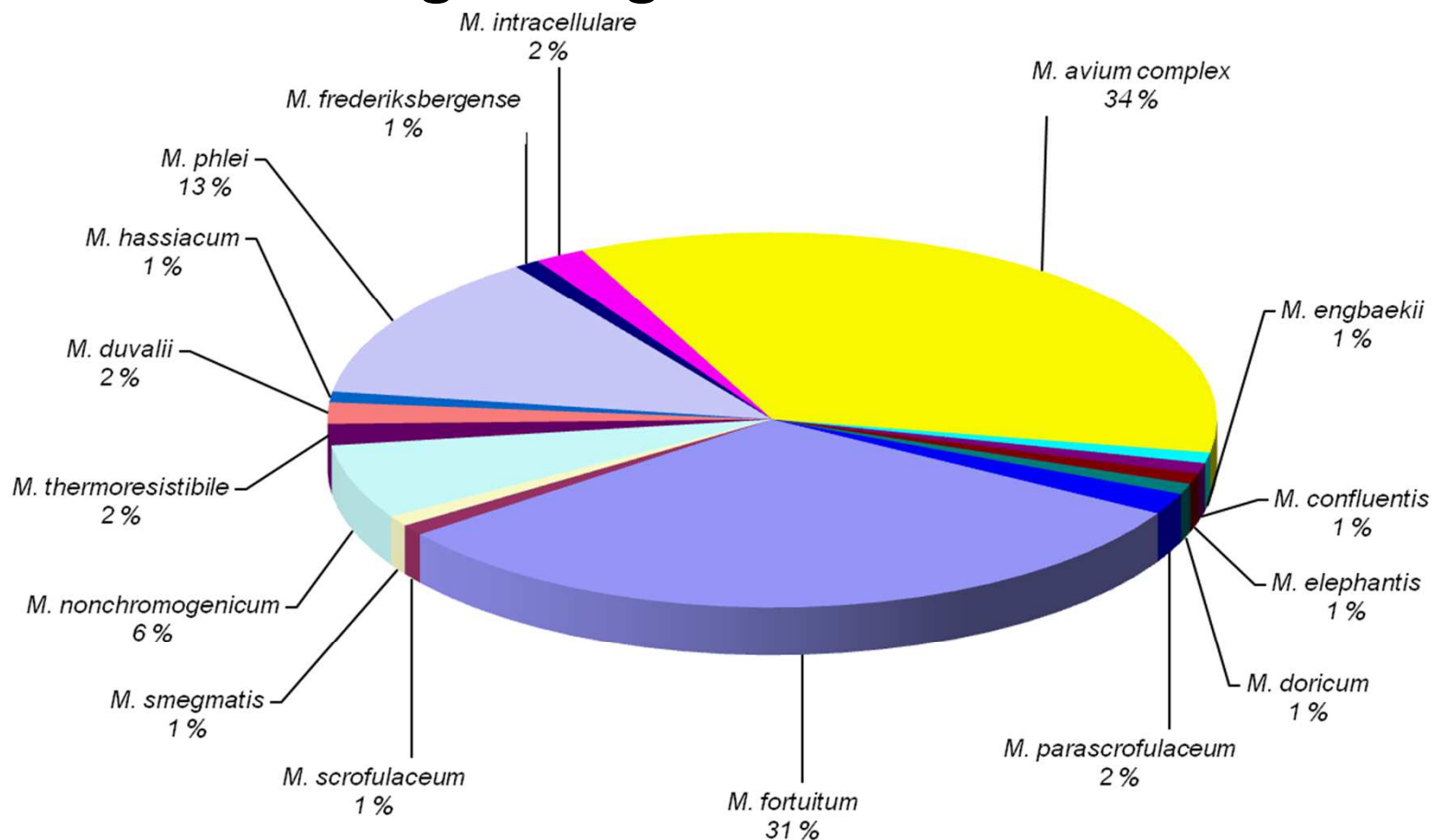
The structure of *Mycobacterium* species cultures selected at NSC "IECVM" and regional veterinary laboratories in Ukraine for 2007-2015



From 2007 to 2015 816 isolates of *Mycobacterium* cultures were identified in Ukraine. 146 of them were classified as cultures *M. bovis*, one culture - for *M. tuberculosis*, 29 culture -for *M. avium*, 640 cultures – for atypical *Mycobacteria* whose role in the epizootiology of tuberculosis is not fully understood.



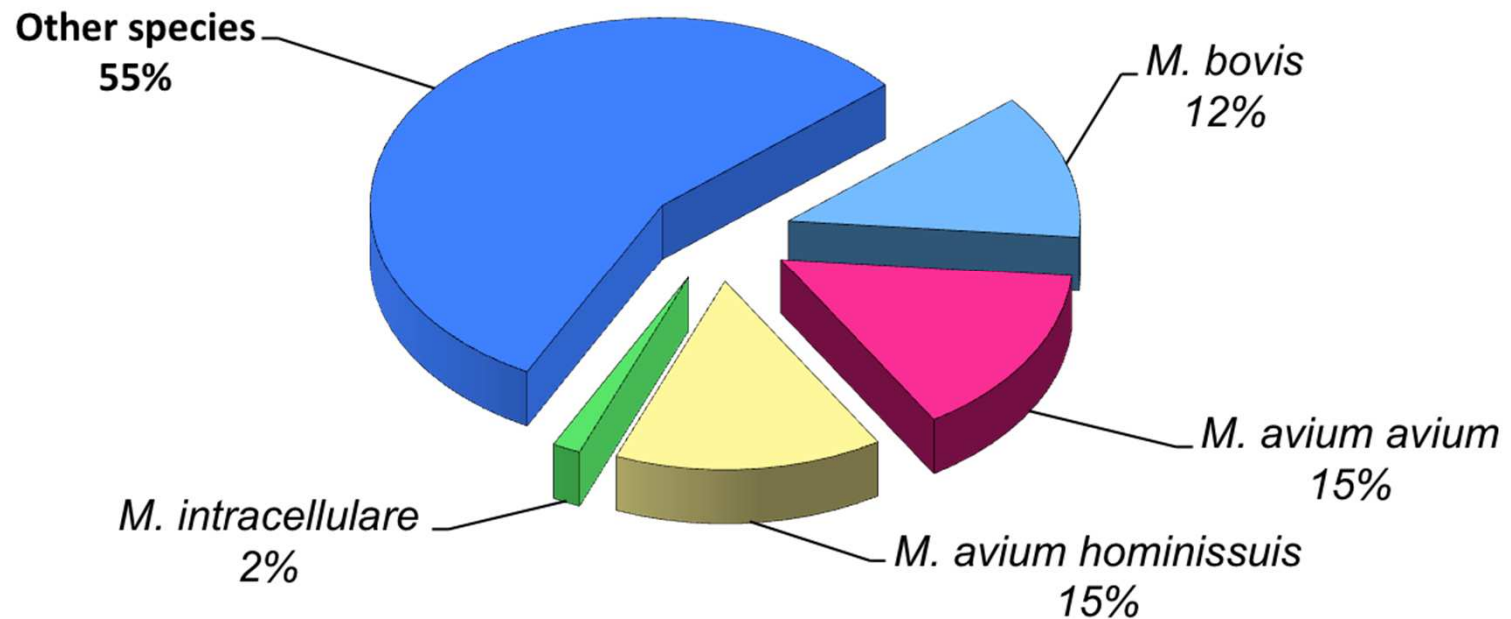
The species spectrum of the atypical *Mycobacteria* circulating among the cattle in Ukraine



The most common mycobacterial cultures in Ukraine are *M. avium complex* (34%) and *M. fortuitum* (31%). At the same time often distinguish *M. phlei* (13%) and *M. nonchromogenicum* (6%). Other *Mycobacterium* are isolated no more than 2% of the studied cultures that are the cause of paralogic reactions in animals.



The results of *Mycobacteria* isolates identification using molecular genetic tests (PCR)



The data obtained indicate the identity of species-specific conservative sites of the genome of *M. bovis* and *M. avium* isolated in Ukraine to Europe. A large number of unidentified atypical mycobacteria causes the necessity of deepening their molecular epidemiological studies.



Scientific and methodological support of tuberculosis in animals diagnostics

According developed "Instruction for Prevention and Control of tuberculosis in animals" with the participation of the NSC "IECVM", system for diagnosing animals tuberculosis in Ukraine include:

The main methods of animals tuberculosis diagnostics :

- Clinical examination;
- Intradermal tuberculin test;
- Autopsy studies;
- Bacteriological examination.

Supporting diagnostic methods of animals tuberculosis :

- Histology;
- Interferon test (not valid instructions prevention and control animals tuberculosis);
- Simultaneous allergic test;
- Intravenous tuberculin test;
- Intradermal test twice;
- Reaction blood mononuclear;
- ELISA;
- BSRA (poultry);
- PCR for the detection and identification *Mycobacterial* DNA .





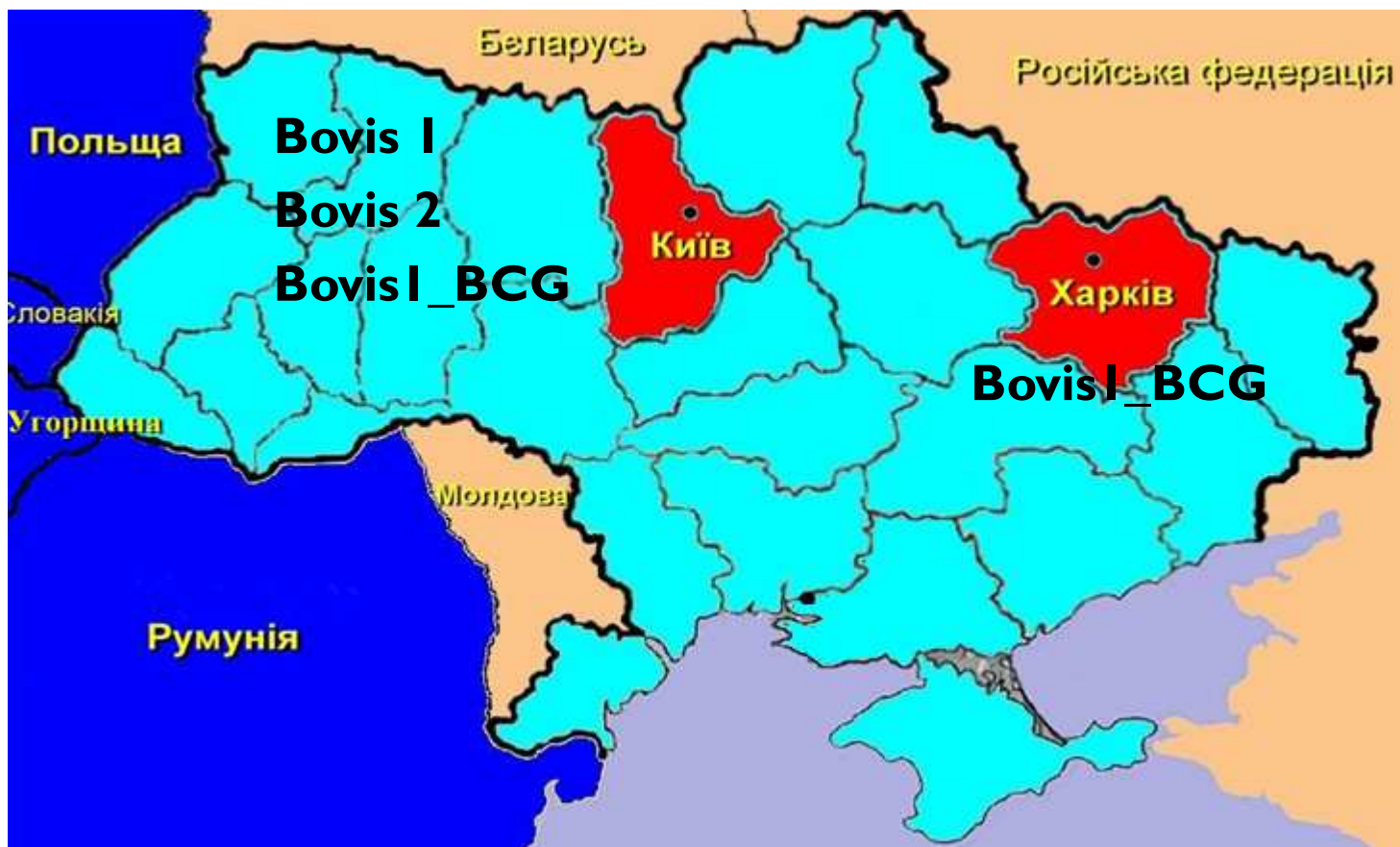
Completed scientific developments of NSC "IECVM" on the tuberculosis problem, that are introduced into production:

- PPD for mammals (TU 24.4-00497087-645-2001);
- PPD for poultry (TU 24.4-00497087-675-2002);
- allergen of atypical mycobacteria masses by means (TU U 24.4-00497087-697-2003);
- National standard tuberculin for mammals;
- Protein – expressing strains IECVM-1 and K-4 *M. bovis*;
- Protein – expressing strain of Mycobacterium tuberculosis IECVM NAAS *M. avium*;
- synthetic nutrient medium for the cultivation and accumulation of bacterial biomass;
- Test kit for PCR "TUBMYC-Ukraine";
- dense nutrient medium for culturing Mycobacterium (TU 24.6-00497087-006-2004);
- disinfectants "DZPT 1" (TU 24.2-00497087-040: 2007)? and "DZPT 2" (TU 24.2-00497087-069: 2010);
- way to determine the quality of disinfection tuberculosis;
- milk disinfection method to install infrared electric heating;
- antigens for RA, CFT and BDRA.





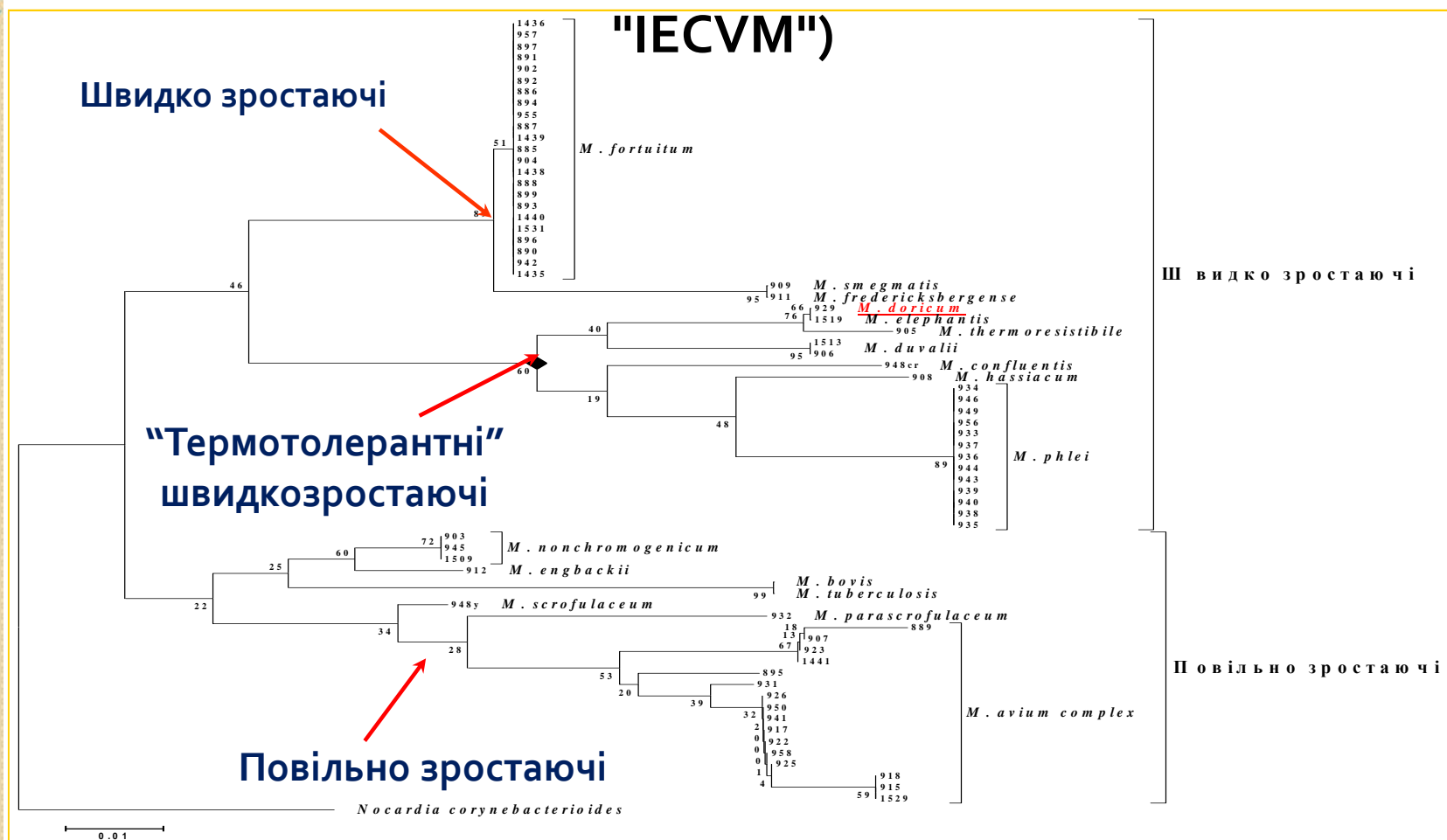
Study of phylogeography genotypes circulating pathogen *M. bovis* (according to NSC "IECVM")



Genotype 2 Bovis and BovisI_BCG *M. bovis* circulating in livestock in Ukraine indicates potential risks of skidding infection from Poland and Romania, as well as some other European countries, and genotype Bovis I - from Poland and Russian Federation.



Phylogenetic relationships of various mycobacteria species isolated in Ukraine (according to NSC "IECVM")



The results of phylogenetic studies demonstrate wide variety of circulating atypical *Mycobacteria* species in their intraspecific conservative background. The data captured in the optimization of manufacturing technology and methodology masses by means of differentiation of infected animals from tuberculosis sensibitized atypical *Mycobacteria*.



Scientific and advisory activities of the NSC "IECVM" for tuberculosis in animals in 2010 - 2015



Researcher of NNC "IECVM" conducted the complex scientific and diagnostic research of 11 150 head of cattle for tuberculosis in 12 herds of livestock farms NAAS in Ukraine.



Provided methodological, and practical advice on assisted diagnosis and recovery from tuberculosis on cattle from 55 farms: Cherkassy, Sumy, Chernihiv, Vinnytsia, Kyiv, Luhansk, Khmelnytsky, Kharkiv, Kherson, Kirovograd, Poltava, Zaporizhia, Zhytomyr and Odessa regions. A total number of scientific and diagnostic tests for tuberculosis is 144 thousand cattle.



By pathological and bacteriological methods studied 1840 samples of biological material for tuberculosis .



Scientifically methodical and organization activities for tuberculosis in animals in Ukraine

In order to coordinate research and promotion of national scientific research, including the problem of tuberculosis in animals last 5 years, held the International Congress of Veterinary Medicine (2013, Kharkiv) and 4 international scientific conferences, including "Important aspects of development, production, quality control and use of veterinary immunological products based on modern biotechnology" (2011, Alushta), "Transmissible animal diseases: topical aspects of biosafety and control" (2012, Alushta), "Transboundary animal diseases, risks, creation of monitoring and urgent problems of biological safety" (2014, Odesa), "Actual problems of food safety (environmental, chemical and biological safety, quality and safety of agricultural products)" (2015, Odesa).

During the last 5 years, organized and held 3 scientific national, 9 regional and 3 – area levels seminars.





NSC "IECVM" international cooperation for tuberculosis problem:

Adjusted cooperation and exchange of biological reagents with diagnostics reference laboratory of the EU and a number of research centers abroad:

- National Center for Animal Disease Control, Ames, USA;
- F.Loflera Institute of Microbiology, Jena, Germany;
- Veterinary Laboratory Agency, Weybridge, UK;
- National Veterinary Research Institute, Pulawy, Poland;
- National Veterinary Institute, Novi Sad, Serbia;
- National Veterinary Institute, Uppsala, Sweden.

8 scholars from NNC "IECVM" acted with scientific reports at international conferences of infectious diseases, including tuberculosis.



Performing researches of tuberculosis in animals in international scientific projects



- 1) P-I60 (PNNL-T2-0274) "The genetic variability of Mycobacterium tuberculosis and atypical mycobacteria isolated from farm animals contaminated zones (2007-2008)";
- 2) P-453 "Improving the diagnosis of infectious animal diseases (tuberculosis and Aujeszky's disease) (2011-2012)".

Project manager: prof. A.I. Zavgorodnii

Collaborator: Dr. R. Weller, Pacific NW National Laboratory, USA





Possible topics for joint scientific research regarding TB

- Development and implementation of the molecular-based multi drug-resistant *Mycobacteria* detection
- Study of molecular characteristics and ecological geography of the *Mycobacteria* species
- Harmonization of diagnostics and surveillance means for TB diagnostics in frames of EU/World-wide requirements and regulations
- Development of effective methods of the soil and environmental objects decontamination from TB agents



**Thanks for your
attention!**