



Workshop Summary

Prioritizing Zoonotic Diseases for Multisectoral One Health Collaboration in Ukraine



World Health Organization

Ukraine



Photo 1. Fields of rye and barley being harvested in Ukraine.

DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Photo 2. Ukrainian Carpathian Mountains in the autumn season.

PARTICIPATING ORGANIZATIONS

- Ministry of Agrarian Policy and Food (MoAPF)
- Ministry of Health (MoH)
- Ukraine Public Health Center (UPHC)
- Chernivetskyi oblast Center for Disease Control and Prevention of the MoH of Ukraine (Chernivetskyi oCDCP)
- State Service of Ukraine on Food Safety and Consumer Protection (SSUFSCP)
- Main Administrations of SSUFSCP in oblasts
- World Health Organization (WHO) Country Office in Ukraine
- WHO Regional Office for Europe (EURO)
- Ministry of Environmental Protection and Natural Resources (MoEPNR)
- Food and Agriculture Organization of the United Nations (FAO) Country Office in Ukraine
- Subregional Office of World Organization of Animal Health (WOAH) for Central Asia
- Jacobs/Defense Threat Reduction Agency (DTRA)
- United States Agency for International Development (USAID)
- ICAP at Columbia University
- US Centers for Disease Control and Prevention (US CDC)



Photo 3. Shepherd and goats walking through the Carpathian Mountains in the early morning.

EXECUTIVE SUMMARY



Photo 4. Participants from the One Health Zoonotic Disease Prioritization Workshop in Ukraine

For years now, Ukraine has committed significant effort and resources to rebuild the country's public health system. Although this process has been complicated and hampered by a global pandemic followed by a war, the government and its relevant ministries and administrative and technical bodies continue to do as much as they can to safeguard the health and welfare of the Ukrainian people.

The COVID-19 pandemic has sparked a renewed interest in One Health and the need for a coordinated and collaborative approach to addressing zoonotic diseases. The One Health Zoonotic Disease Prioritization (OHZDP) workshop is an important step towards strengthening Ukraine's preparedness and response to zoonotic diseases.

One of the overarching recommendations in the final report of the Joint External Evaluation that took place at the end of 2021 relates to the adoption and implementation of One Health and all-hazards approaches throughout government, across sectors and between ministries. One key recommendation was that stakeholders conduct a prioritization exercise for zoonotic diseases under surveillance in both the human and the animal sectors, using a risk assessment methodology adapted for Ukraine.

Furthermore, the recently adopted Law of Ukraine on the Public Health System introduced a One Health approach that should lead to better communication between the health service, the veterinary service, and food safety authorities. It also has a clear provision to develop and operate the exchange of information on cases of infectious diseases common to animals and humans between the bodies and institutions of veterinary medicine and public health institutions.

The purpose of the OHZDP workshop for Ukraine was to prioritize zoonotic diseases of greatest concern using a One Health approach with equal input from representatives of human, animal (domestic and wildlife), and environmental health sectors and other relevant partners.

The specific workshop goals were to use a One Health approach to

1. Prioritize zoonotic diseases of greatest concern for Ukraine, according to the International Health Regulations (2005)
2. Develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners.

During the workshop, participants developed a list of zoonotic diseases for prioritization for Ukraine, defined the criteria for prioritization, and determined questions and weights relevant to each criterion. A total of 10 zoonotic diseases were identified as a priority by participants using a mixed methods prioritization process, the OHZDP Process, developed by the U.S. Centers for Disease Control and Prevention (CDC) (Appendix A).

After the participants selected the priority zoonotic diseases, they developed next steps and action plans to address the priority zoonotic diseases using a One Health approach with multisectoral collaboration. Table 1 shows the priority zoonotic diseases for One Health collaboration in Ukraine.

Table 1. Priority zoonotic diseases for One Health collaboration in Ukraine, listed in ranked order.

Zoonotic Disease	Agent
Tularemia	<i>Francisella tularensis</i>
Zoonotic avian influenza	Influenza A viruses
Rabies	Rabies virus
COVID-19	SARS-CoV-2
Crimean-Congo hemorrhagic fever	Crimean-Congo hemorrhagic fever virus
Salmonellosis	<i>Salmonella spp.</i>
Hantavirus infection	Hantavirus
Trichinellosis	<i>Trichinella spiralis</i>
Anthrax	<i>Bacillus anthracis</i>
Q Fever	<i>Coxiella burnetii</i>

This report summarizes the OHZDP process used to prioritize zoonotic diseases of greatest concern for Ukraine, as well as next steps and action plans to jointly address these zoonotic diseases using a One Health approach including human, animal, and environmental health ministries and other relevant sectors.



Photo 5. Sunflower with city backdrop in Ukraine.

INTRODUCTION

Zoonotic diseases are diseases that are spread between animals and people. Most known human infectious diseases and about three-quarters of newly emerging infections originate from animals.

Zoonotic diseases that occur in large numbers can impact society in three main ways. Specifically, they:

- Threaten the health of animals resulting in illness, loss of productivity, and death.
- Threaten the livelihood of the population dependent on livestock as a major source of income.
- Threaten the health of people, with ability to cause a large number of illnesses and deaths, which is associated with significant social and economic losses.

To best address zoonotic disease threats, a One Health approach is needed. One Health means a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment.



Photo 6. Chestnut horse in the Carpathian Mountains, Ukraine.

To begin addressing zoonotic disease challenges in Ukraine, an OHZDP workshop was held on March 29–31, 2023, in Rzeszow, Poland. The specific workshop goals were to use a One Health approach to

1. Prioritize zoonotic diseases of greatest concern for Ukraine, according to the International Health Regulations (2005);
2. Develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners

To build in-country capacity to conduct future OHZDP workshops, three staff members were trained as OHZDP facilitators from the following relevant national One Health sectors and partners:

- State Service of Ukraine on Food Safety and Consumer Protection (SSUFSCP)
- Ukraine Public Health Center (UPHC)

In addition, five staff members from the WHO Country Office in Ukraine and the WHO Regional Office for Europe were trained to further strengthen in-country and regional capacity on the use of the OHZDP.

WORKSHOP METHODS

The OHZDP process uses a mixed methods prioritization process developed by US CDC’s One Health Office. The methods have been previously described in detail (Appendix A). Workshop organizers began to prepare and plan for this workshop months in advance. An initial list of zoonotic diseases was developed for Ukraine based on the list of infectious diseases approved by orders of the Ministry of Health (MoH) (Order MoH dated of 30.07.2020 № 1726) and Ministry of Agrarian Policy and Food (MoAPF) (Order MoAPF dated of 18.07.2022 № 473). A zoonotic disease was selected for the initial list of zoonotic diseases if it was known to be spread between humans and animals and was of concern for Ukraine. Zoonotic diseases on human or animal reportable and registered in-country disease lists were included on the initial list. During the workshop, participants first reviewed the initial zoonotic disease list to consider for prioritization. The initial list of 40 zoonotic diseases, shown in Appendix C, was considered and approved by the voting members for use during the workshop.

During the workshop, participants developed five criteria for ranking the 40 zoonotic diseases. Once the five criteria were developed, one categorical question was developed for each criterion through group discussion. The questions were developed to best measure each criterion. All questions had ordinal, binomial, or multinomial answers. The ordinal nature is necessary for the scoring process and each answer choice was given a score, which was determined by the participants. Voting members then individually ranked their preferences for the relative importance of each criterion for their sector. Each individual voting member’s ranking was then entered into OHZDP Tool by a facilitator and a group weight for each criterion was calculated. Facilitators and participants answered each question for each zoonotic disease using data that were identified through an extensive literature search, as well as information from the World Health Organization (WHO), the World Organisation for Animal Health (WOAH), ProMED, and other relevant sources. Data on disease transmission, severity, pandemic and epidemic potential, economic impact, prevention and control, and environmental impact were collected for each zoonotic disease. If information for a particular zoonotic disease was not available for Ukraine, data from neighboring countries, the region or globally, in that order, were used as proxy. Published articles additionally were collected with zoonotic disease-specific information on transmission, severity, pandemic and epidemic potential, economic impact, prevention and control, and environmental impact for the country, region, and globally. These references were compiled and shared with all workshop participants.



Photo 7. Photo 6. Meeting participants attend the OHZDP workshop in Rzeszow, Poland.



Photo 8. Aerial view of Saint Sophia Cathedral and the city of Kyiv, Ukraine .

After scoring all zoonotic diseases, decision tree analysis was used to determine the ranked zoonotic disease list. Each weighted criterion was applied across each question's answers for each zoonotic disease. The scores for all five questions for each zoonotic disease were summed. The raw scores were then normalized with the zoonotic disease with the highest raw score given a score of 1. See Appendix C for a complete listing of raw and normalized scores for all zoonotic diseases that were considered for prioritization.

The zoonotic diseases with their raw and normalized scores were presented to the participants for discussion. Workshop participants then used the ranked OHZDP list to discuss and decide on a final priority list of zoonotic diseases (Appendix C). After the participants decided on the priority zoonotic diseases, they developed next steps and action plans around short, medium, and long-term goals to address the priority zoonotic diseases.

CRITERIA AND QUESTION DESCRIPTION DEVELOPED

The criteria for ranking zoonotic diseases selected by the voting members in Ukraine are listed in order of importance below (Table 2). A description of how the questions assessed the criteria are listed below. For the full question and answer choices, see Appendix D.

Rank	Criteria	Weight	Question Description
1	Zoonotic disease presence in Ukraine	0.248	Have cases of the zoonotic disease been registered in Ukraine in the past 3 years in people or animals?
2	Societal, economic, and environmental impact	0.245	What are the social, economic, and environmental impacts of the zoonotic disease in Ukraine?
3	Zoonotic disease management capacity	0.238	Are there implemented tools for zoonotic disease management for humans or animals in Ukraine?
4	Epidemiologic profile—human transmission and severity of disease	0.191	Does the disease have the potential for human-to-human transmission and have high fatality rate?
5	Potential for bioterrorism	0.078	Is the agent listed on the Ukraine list of potential bioterrorism agents?

PRIORITY ZONOTIC DISEASE LIST FOR UKRAINE

The priority zoonotic diseases for One Health collaboration for Ukraine, listed in ranked order, are (Appendix C):

- Tularemia
- Zoonotic avian influenza
- Rabies
- COVID-19
- Crimean-Congo hemorrhagic fever
- Salmonellosis
- Hantavirus infection
- Trichinellosis
- Anthrax
- Q Fever



Photo 9. View from the Carpathian Mountains in the morning light.



Photo 10. A cat sits peacefully on a parapet wall against the backdrop of buildings in Ukraine.

NEXT STEPS AND ACTIONS PLANS

After finalizing the list of priority zoonotic diseases, workshop participants discussed next steps and action plans for the most effective way to overcome challenges regarding prevention and control, as well as to address the priority zoonotic diseases using a One Health approach. A summary of the recommendations organized by theme follows:

Joint Risk Assessment

Next Steps	Indicator to measure success	Responsible Sector
Hold a Joint Risk Assessment (JRA) workshop for priority zoonotic diseases carried out with the support of WHO, FAO, and WOA H	The seminar was held	MOH/UPHC SSUFSCP MoAPF MoEPNR
Establish a working group to organize a JRA for priority zoonotic diseases	A working group has been created	SSUFSCP MoAPF MOH/UPHC MoEPNR
Periodic working group meetings to review and assess the risks of priority zoonotic diseases	The frequency of risk assessment is determined	SSUFSCP MoAPF MOH/UPHC
Timeframe for Progress: Q3 2023		

Data (information) Exchange

Next Steps	Indicator to measure success	Responsible Sector
Determination of the list of data (creation of a form/table) and the frequency of information exchange	Data for exchange between sectors is defined	MOH/UPHC SSUFSCP
Introduce systematic data exchange between sectors	Intersectoral data exchange is carried out within a specified period	MOH/UPHC SSUFSCP
Review and analysis of the specified list of data	Reviewed and analyzed	SSUFSCP MOH/UPHC
Timeframe for Progress: Every 6 months		

Surveillance, Prevention, and Control

Next Steps	Indicator to measure success	Responsible Sector
To review and analyze available approaches on epidemiologic/epizootic surveillance over prioritized zoonotic diseases	Reviewed and analyzed	MOH/UPHC SSUFSCP MoAPF
To develop proposals and/or drafts of legal acts related to improvement of the epidemiologic/epizootic surveillance over priority zoonotic diseases	Developed or undeveloped proposals	MOH/UPHC SSUFSCP MoAPF
Development of proposals for joint control and prevention measures	Developed or undeveloped proposals	Ministries, agencies in the field of their responsibilities
Timeframe for Progress: Q1 2024		

Laboratory Capacity

Next Steps	Indicator to measure success	Responsible Sector
Mapping and revision of national legislation on laboratory protocols regarding each priority zoonotic disease	Reviewed legislation	MOH/UPHC MoAPF SSUFSCP
To conduct capacity and needs assessment to build potential of laboratory network regarding each priority zoonotic disease	Conducted capacity and needs assessment	The laboratory and the authority in the sphere of management of which the laboratory is located
Budget needs planning to increase laboratory network capacity regarding each priority zoonotic disease	Budget needs is planned	The laboratory and the authority in the sphere of management of which the laboratory is located
To ensure coordination and communication regarding the financing of needs, according to responsibilities, from the state budget, as well as for attracting international donor assistance	Coordination and communication is ensured	MOH/UPHC SSUFSCP MoAPF
Timeframe for Progress: After 1 year		

Outbreak, Preparedness, & Response

Next Steps	Indicator to measure success	Responsible Sector
To establish technical expert working group (multisectoral) to develop response plans to all priority zoonotic diseases	Working group is established	Within WHO initiative SSUFSCP MoAPF MOH/UPHC
To assess existing, draft new, and/or update existing joint emergency and control plans for priority zoonotic diseases	Assessed existing and drafted new plans	Ministries, agencies in the field of their responsibilities
To develop the joint (incl. national and regional levels) training and simulation exercise (SimEx) plan to exercise contingency and control plans (incl. on lab capacity) relevant to priority zoonotic diseases (developed under previous activity)	Training and SimEx plan are developed	Working group
Conduct joint After Action Reviews (incl. corrective actions) for real events caused by priority zoonoses	After Action Review is conducted	Working group
To estimate budget for implementation of trainings and SimExes for three years	Budget is estimated	Working group
Timeframe for Progress: Until the end of 2023		

Workforce

Next Steps	Indicator to measure success	Responsible Sector
To develop/improve intersectoral training programs for professional development	Developed/improved programs	Ministry of Education MOH MoAPF SSUFSCP
To analyze topics and assess needs in online courses for e-learning platforms (UPHC, SSUFSCP) according to priority zoonotic diseases	Assessed available courses, formulated list of topics	MOH/UPHC MoAPF SSUFSCP
To develop training materials on absent priority zoonotic diseases	Developed training materials	MOH/UPHC MoAPF SSUFSCP
To assess current curricula in medical and veterinary faculties according to relevant information on priority zoonotic diseases	Assessed curricula	MOH MoAPF SSUFSCP
To provide proposals to universities' curricula accordingly	Updated curricula	Ministry of Education MOH MoAPF SSUFSCP
To conduct joint trainings (incl. SimEx) on prioritized zoonotic diseases	Joint simulation exercises trainings were conducted	SSUFSCP MOH/UPHC
Timeframe for Progress: on an annual basis		

APPENDIX A: Overview of the One Health Zoonotic Disease Prioritization Process

U.S. Centers for Disease Control and Prevention: Overview of the One Health Zoonotic Disease Prioritization Workshop <https://www.cdc.gov/onehealth/what-we-do/zoonotic-disease-prioritization/>

ONE HEALTH ZONOTIC DISEASE PRIORITIZATION PROCESS OVERVIEW

Goals of the One Health Zoonotic Disease Prioritization Process

- ▶ To use a multisectoral, One Health approach to
 1. Prioritize zoonotic diseases of greatest concern
 2. Develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners

OHZDP Workshop Process

BEFORE THE WORKSHOP

➔ **Prepare and Plan for the Workshop**

- Contact the CDC One Health Office at least 3 months before scheduling a workshop.
- Identify Core Planning Team and obtain financial resources to accommodate for workshop logistics, venue, materials, travel, and translation.
- Identify workshop participants (facilitators, voting members, advisors) from human, animal, and environmental health sectors and other related partners.
- Generate an initial list of zoonotic diseases to be considered for prioritization using reportable disease lists, literature, and input from all represented One Health sectors.
- Conduct a literature review on the initial list of zoonotic diseases by reviewing publications, reports, grey literature, etc.

DURING THE WORKSHOP

➔ **Develop Criteria**

- 5 criteria will be used to prioritize the list of zoonotic diseases; criteria are locally appropriate and address the needs of each unique location.

➔ **Develop Questions**

- 1 categorical question will be developed to measure each criteria.

➔ **Rank Criteria**

- Each voting member will rank criteria in their preferred order, allowing each sector to address their sector's priorities and needs. Individual rankings are combined to produce a combined ranked list of criteria.

➔ **Prioritize Zoonotic Diseases**



- Score each zoonotic disease by answering the categorical questions for each weighted criterion and entering this data into the OHZDP Tool.
- The ranked zoonotic disease list from the OHZDP Tool is used to facilitate discussion among the participants to finalize the priority zoonotic disease list.

➔ **Discuss Next Steps and Action Plans for Multisectoral, One Health Engagement**

- Discuss next steps and action plans for identifying areas for One Health engagement for prevention and control of the prioritized zoonotic diseases.

AFTER THE WORKSHOP

- Stakeholders advocate and implement recommended next steps and action plans to implement a One Health approach for the priority zoonotic diseases.

OHZDP Workshop Outcomes

- A list of priority zoonotic diseases of greatest concern agreed upon by all represented One Health sectors
- Understanding of the roles and responsibilities of all represented One Health sectors
- Recommendations for next steps and action plans for multisectoral, One Health engagement to address the priority zoonotic diseases
- The creation or strengthening of multisectoral, One Health coordination mechanisms and networks
- A report highlighting the outcomes of the workshop to help advocate for One Health priorities

www.cdc.gov/onehealth/global-activities/prioritization.html

APPENDIX B: One Health Zoonotic Disease Prioritization Workshop Participants for Ukraine

Voting Members

Name	Organization	Title/Position
Mr. Borys Kobal	MoAPF	Head of Unit on Animal Health and Welfare
Mrs. Nataliia Shchyrova	MoAPF	Head of Unit on Food Safety
Mr. Dmytro Bohach	MoAPF	Chief Specialist of Unit on Food Safety
Mr. Oleksiy Klymenok	SSUFSCP	Head of Unit on Animal Health and Welfare
Mr. Ivan Vaskiv	Regional SSUFSCP	Head of Directorate on Food Safety and Veterinary Medicine of Ivano-Frankivsk regional SSUFSCP
Mr. Ihor Huzar	Regional SSUFSCP	Deputy Head of Directorate on Food Safety and Veterinary Medicine—Head of Unit on Antiepidemiological Activities of Khmelnytsk Regional SSUFSCP
Mrs. Tetiana Skapa	MoH	Head of Unit for Prevention on Non-infectious Diseases and Circulation of Drugs; Department of Public Health
Mrs. Mariia Dymytrenko	MoH	Specialist, Unit on Safety of Human Living Environment of Department on Public Health
Ms. Svitlana Aleksenko	MoH	Chief Specialist Unit for the prevention of infectious diseases and immunoprophylaxis
Mrs. Liudmyla Slobodianyuk	WHO country office in Ukraine	Technical Officer (Health Information and Risk Assessment)
Ms. Lina Tolstova	UPHC	Epidemiologist, Unit of epidemiological Surveillance
Mr. Yurii Paduraru	Regional UPHC	Head of Unit on Epidemiological Surveillance and Prevention of Infectious Diseases

Advisors

Name	Organization	Title/Position
Mr. Vitalii Bashynskiy	FAO Ukraine	National coordinator at FAO, Ukraine (Nominated by SSUFSCP)
Mr. Volodymyr Domashlinets	MoEPNR	Head of Biological Diversity Conservation and Biosafety Division, Department of Nature Protection Fund and Biodiversity
Ms. Olena Kuriata	WHO Country Office in Ukraine	One Health Consultant
Mrs. Hanna Tereshchenko	WHO Country Office in Ukraine	Technical Officer (Country Preparedness and IHR)
Mr. Artem Skrypnyk	WHO Country Office in Ukraine	Technical Officer (Laboratory)
Mr. Volodymyr Polishchuk	FAO	Consultant
Mr. Mario Latini	WOAH	One Health expert
Mr. Reinhard Kaiser	WHO EURO	Consultant
Ms. Iaroslava Maksymovych	Jacobs/DTRA	Biosafety and Biosecurity Manager
Mr. Konrad T. Juskiewicz	USAID	Senior Technical Advisor for Global Health Security and COVID-19
Mr. Kassa Getachew	ICAP	Quality Improvement Adviso

Trained National Facilitators

Name	Organization	Title/Position
Mrs. Svitlana Shlapatska	SSUFSCP	Deputy Head of Unit on Animal Health and Welfare
Mrs. Iryna Kysliak	UPHC	Epidemiologist, Unit of Epidemiological Surveillance
Mrs. Nataliia Akulshyna	UPHC	Specialist, Unit on Emergency Readiness and Response

External Facilitators

Name	Organization	Title/Position
Dr. Sean Shadomy	US CDC	Senior Advisor, CDC One Health Office
Dr. Natalie Wendling	US CDC	Veterinary Medical Officer, CDC One Health Office

Workshop Organizers

Name	Organization	Title/Position
Mr. Mykhailo Slyzhuk	MOH	Chief Specialist of Unit of safety on human living environment
Ms. Svitlana Aleksenko	MOH	Chief Specialist of Unit on prevention of infectious diseases and immunoprophylaxis
Mr. Borys Kobal	MoAPF	Head of Unit on Animal Health and Welfare
Mrs. Nataliia Shchyrova	MoAPF	Head of Unit on food safety
Mr. Dmytro Bohach	MoAPF	Chief Specialist of Unit on food safety
Mr. Volodymyr Matviienko	MoAPF	Chief Specialist of Unit on animal health and welfare
Mr. Oleksiy Klymenok	SSUFSCP	Head of Unit on Animal Health and Welfare
Mrs. Svitlana Shlapatska	SSUFSCP	Deputy Head of Unit on Animal Health and Welfare
Mrs. Nataliia Akulshyna	UPHC	Epidemiologist of the Unit on IHR and Emergency Response
Mrs. Iryna Kysliak	UPHC	Epidemiologist of the Unit on IHR and Emergency Response
Mr. Anton Fabish	UPHC	Epidemiologist of the Unit on IHR and Emergency Response
Mr. Oleksandr Skapa	UPHC	Head of Unit on IHR and Emergency Response
Mrs. Anna Tereshchenko	WHO Country Office in Ukraine	Technical Officer (Country Preparedness and IHR)
Ms. Olena Kuriata	WHO Country Office in Ukraine	One Health Consultant
Mr. Artem Skrypnyk	WHO Country Office in Ukraine	Technical Officer (Laboratory)
Mrs. Grace Goryoka	US CDC	Public Health Advisor, One Health Office
Mrs. Hayley Belles	US CDC	Health Scientist, One Health Office
Dr. Sean Shadomy	US CDC	Senior Advisor, One Health Office
Dr. Natalie Wendling	US CDC	Veterinary Medical Officer, One Health Office

Interpreters of the Workshop

Name	Organization	Title/Position
Mrs. Svitlana Panteleymonova	WHO Country Office in Ukraine (contracted)	Simultaneous interpreter
Ms. Maryna Molodets	WHO Country Office in Ukraine (contracted)	Simultaneous interpreter



Photo 11. Aerial view of rainbow housing complex in Kyiv, Ukraine

APPENDIX C: Criteria, questions and numerical weights for the criteria selected for ranking zoonotic diseases in Ukraine

Rank#	Zoonotic Disease	Etiologic Agent	Raw Score	Normalized Final Score
1	Tularemia	<i>Francisella tularensis</i>	1.077	1.000
2	Zoonotic avian influenza	Influenza A viruses	1.060	0.985
3	Rabies	Rabies virus	0.957	0.889
4	Coronavirus disease 2019	SARS-COV-2	0.939	0.872
5	Crimean-Congo hemorrhagic fever	Tick-borne virus (Nairovirus)	0.919	0.854
6	Salmonellosis	<i>Salmonella spp.</i>	0.874	0.812
7	Hantavirus infection	Hantavirus	0.856	0.795
8	Trichinellosis	<i>Trichinella spiralis</i>	0.853	0.792
9	Anthrax	<i>Bacillus anthracis</i>	0.850	0.789
10	Q Fever	<i>Coxiella burnetii</i>	0.848	0.788
11	Zoonotic tuberculosis	<i>Mycobacterium bovis</i>	0.835	0.775
12	Plague	<i>Yersinia pestis</i>	0.833	0.774
13	Brucellosis	<i>Brucella spp.</i>	0.829	0.770
14	Listeriosis	<i>Listeria monocytogenes</i>	0.817	0.759
15	Newcastle	Newcastle disease virus	0.809	0.752
16	Ornithosis	<i>Chlamydia psittaci</i>	0.753	0.700
17	Mpox	Mpox virus	0.753	0.700
18	Glanders	<i>Burkholderia mallei</i>	0.751	0.697
19	Leptospirosis	<i>Leptospira spp.</i>	0.708	0.657
20	West Nile Fever	West Nile virus	0.708	0.657
21	Yellow Fever	Yellow fever virus	0.706	0.656
22	Cowpox	Cowpox virus	0.691	0.642
23	Ebola	Ebola virus	0.674	0.626
24	Dengue	Dengue virus	0.673	0.625
25	E. Coli	<i>Escherichia coli</i>	0.665	0.618
26	Variant Creutzfeldt–Jakob disease (vCJD)	BSE PrP(Sc)	0.650	0.604
27	Leishmaniasis	<i>Leishmania spp.</i>	0.628	0.583
28	Dirofilariasis	<i>Dirofilaria immitis</i>	0.626	0.581
29	Echinococcosis (hydatid disease)	<i>Echinococcus spp.</i>	0.626	0.581
30	Anaplasmosis	<i>Anaplasma phagocytophilum</i>	0.626	0.581
31	Campylobacteriosis	<i>Campylobacter spp.</i> - zoonotic	0.626	0.581
32	Yersiniosis	<i>Yersiniosis enterocolitica</i>	0.626	0.581
33	Babesiosis	<i>Babesia spp.</i>	0.626	0.581

Rank#	Zoonotic Disease	Etiologic Agent	Raw Score	Normalized Final Score
34	Tick-borne encephalitis	Tick-borne encephalitis virus	0.626	0.581
35	Cysticercosis	<i>Taenia spp.</i>	0.626	0.581
36	Lyme disease	<i>Borrelia burgdorferi</i>	0.626	0.581
37	Toxoplasmosis	<i>Toxoplasma gondii</i>	0.626	0.581
38	Chikungunya virus disease	Chikungunya virus	0.564	0.524
39	Japanese encephalitis	Japanese encephalitis virus	0.471	0.438
40	Rift Valley fever	Rift Valley fever virus	0.404	0.375



Photo 12. Children celebrating Independence Day of Ukraine. The united hands form a circle and symbolize unity.

APPENDIX D: Criteria and Questions

A. Society, economic, and environmental/ecological impact (criteria weight = 0.245)

Question: To what extent does the disease result in death (CFR >1%) among the general population?

Definitions:

The three impacts are:

- (1) Production impact (incl. >10% mortality)
- (2) Depopulation
- (3) Trade restrictions

Assumptions:

Production animal deaths resulting from disease and depopulation measures for control of zoonotic disease outbreaks will negatively affect the economy, society, and the environment (as a result from need for disposal of carcasses, replacement of animals, etc.). Trade restrictions will have negative effects on personal and society economic security

Answer:

- Minimal impacts (Score = 1)
- One of the impacts (Score = 2)
- Two of the impacts (Score = 3)
- Three of the impacts (Score = 4)

B. Zoonotic disease presence in Ukraine (criteria weight = 0.248)

Question: Have cases of the zoonotic disease been registered in the Ukraine in the past 3 years in people or animals?

Definition:

Definitions of sporadic, outbreak, and epidemic/zooepidemic are defined by Ukrainian legislation

Answer:

- No cases (Score = 1)
- Sporadic cases (Score = 2)
- Regional outbreak (Score = 3)
- National outbreak (Score = 4)
- Epidemic or epizootic (Score = 5)

C. Epidemiologic profile (criteria weight = 0.191)

Question: Does the disease have the potential for human to human transmission and have high fatality rate?

Definition:

High fatality rate is >5%

Answer:

- No, low fatality <5% (Score = 1)
- No, High fatality >5% (Score = 2)
- Yes, low fatality <5% (Score = 3)
- Yes, High fatality >5% (Score = 4)

D. Disease Control Potential (criteria weight = 0.238)

Question: Are there implemented tools for disease management (diagnostics, treatment or prevention) in Ukraine?

Definition:

Diagnostics = Diagnostic assays are available and used in Ukraine

Prevent and Treat = vaccines, prophylaxis or treatment are available and implemented in Ukraine

Answer:

- Diagnostics and either treatment or prevention are implemented in Ukraine (Score = 4)
- No diagnostics are implemented; either treatment or prevention are implemented in Ukraine (Score = 3)
- Diagnostics are implemented; neither treatment nor prevention are implemented in Ukraine (Score = 2)
- Neither diagnostics, treatment nor prevention are implemented in Ukraine (Score = 1)

E. Potential for use as a bioterrorism agent (criteria weight = 0.078)

Question: Is the agent listed on the Ukraine list of potential bioterrorism agents?

Definition:

Ukraine bioterrorism list is defined in the Order of the Ministry of Health of Ukraine, 08/03/2020

No. 1777 (<https://zakon.rada.gov.ua/laws/show/z1110-20#Text>)

Answer:

- Yes, Category A (Score= 3)
- Yes, Category B or C (Score= 2)
- No, not listed (Score= 1)



Photo 13. Sunset over power lines in a wheat field in Ukraine.

<http://www.cdc.gov/onehealth>