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Development of conventional designations for veterinary epidemic significant objects

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Abstract

Background and Aim. Epidemiologically significant objects are objects related to veterinary activities, requiring strict control and supervision, since violation of sanitary and hygienic requirements imposed on them, deterioration of the epidemiological situation at these objects can contribute to the emergence and spread of diseases, which in turn will lead to large negative economic, environmental and social consequences. This research aims to develop conventional designations of objects that have epidemiological significance in the country for their subsequent use in cartographic analysis, forecasting, and risk assessment of the spread of infectious diseases.

Materials and Methods. Conventional forms were developed for almost all objects that may have any epidemiological significance. These facilities were relatively categorized into 4 areas: veterinary, agricultural, municipal, and other epidemically significant facilities. Conventional forms of designation of epidemically significant objects were developed using the CorelDraw program.

Results. In total, symbols have been developed for 48 epidemiologically significant objects, including 14 veterinary, 17 agricultural, 7 municipal, and 10 other objects. The shape of all symbols was defined as a quadrangle with equal sides, while each group of symbols has its color for the border of the figure. The design and drawing of each symbol were developed in such a way that both specialists and ordinary users could visually understand what this sign meant.

Conclusion. The developed symbols will allow more effective use of information and communication technologies for forecasting and assessing the risk of spreading the most relevant contagious diseases in our country. This will subsequently allow more effective preventive and anti-epizootic measures.

Key words: epidemiologically significant objects; epizootic situation; mapping; prevention; symbols.

Introduction

It is a well-known fact that in many socially significant zoonoses, one of the main factors that significantly influence the epizootic process of a particular nosological unit is epidemiologically significant veterinary objects. In this regard, the role of the areas of epizootiology and epidemiology that study potentially dangerous (epidemic significant) veterinary objects, as well as the characteristics and patterns of the spread and manifestation of infectious diseases in various natural and socioeconomic conditions, has increased to assess the epizootic risk and rationalize the systems of anti-epizootic

measures to reduce the risk of animals and the population becoming infected with socially significant infections [1, 2, 3]. Now, Kazakhstan is experiencing a complex epizootological and epidemiological situation for certain infectious diseases [4, 5, 6]. In recent years (2020-2024), the following diseases have been registered in the country among the most dangerous diseases of animals and humans: foot-and-mouth disease, anthrax, rabies, brucellosis, pasteurellosis, etc. In addition, isolated cases of soil and natural focal infections dangerous to humans and animals are registered annually in the Republic of Kazakhstan, such as tularemia, rabies, Aujeszky's disease, tuberculosis, listeriosis, sheep pox, leptospirosis, enterotoxaemia, etc. [7-10].

In this aspect, it is obvious that one of the factors that significantly influence the epizootic situation for socially significant zoonoses in a particular region of the country are epidemiologically significant veterinary facilities and their safety. Epidemiologically significant objects are veterinary objects (cattle burial grounds, Beccari pits, animal carcass disposal points and other biological waste, slaughterhouses, etc.) that require strict control and supervision, because failure to comply with sanitary and hygienic requirements imposed on them, deterioration of the epidemiological situation at these objects can contribute to the emergence and spread of diseases, which in turn will lead to major negative economic, environmental and social consequences [11]. In the established practice, the identification of epidemiologically significant objects is carried out taking into account communities and the main mechanisms of transmission of pathogens. Russian scientists propose classifying epidemiologically significant objects: agricultural, veterinary, municipal, and others [12]. Information on epidemiologically significant veterinary objects is one of the important parameters necessary for assessing and interpreting the manifestation of the epizootic process and planning anti-epizootic measures. Therefore, the definition and identification of epidemiologically significant veterinary objects will make it possible to compile a single register of data on such objects, with their characteristics and degree of potential danger. Based on the above, the purpose of this research is to develop conventional designations of objects that have epidemiological significance in the country for their subsequent use in cartographic analysis, forecasting, and risk assessment of the spread of infectious diseases.

Materials and Methods

The studies were conducted at the Faculty of Veterinary and Animal Husbandry Technology, S. Seifullin Kazakh Agrotechnical Research University, using the software of the laboratory of «Risk Analysis and Forecasting in Veterinary». Primary data on existing epidemically significant objects in the country were collected through expeditionary visits to the administrative districts of 17 regions. Conventional forms were developed for almost all objects that may have any epidemiological significance. Such objects are conventionally classified into 4 areas: veterinary epidemically significant objects (veterinary stations, clinics, pharmacies, laboratories, cattle burial grounds; including anthrax, Bekkari pits, biological enterprises, etc.); agricultural (industrial) epidemically significant objects (livestock enterprises, enterprises for the production of agricultural products, processing plants, places of animal slaughter: slaughterhouses, sites, etc.); municipal epidemically significant objects (landfills, transport hubs (railway and bus stations, airports), recycling plants, exhibitions, etc.) and other objects (zoos, nature reserves, game reserves, hunting farms, nurseries, etc.).

Conventional forms of designation of epidemically significant objects were developed using the CorelDraw program [13].

For this purpose, a platform for the developed conventional designation is created in the CorelDRAW program, the parameters of the drawing are specified (shape, size, resolution, color differences of the background, border, and sign symbolizing a certain object). In some cases, when creating the symbol, we used the default settings of the CorelDRAW program itself or data from the Internet, social networks, and other platforms. You can browse and search for default settings. The symbol for each epidemiologically significant object was developed so that both specialists and ordinary users in most cases could visually understand what this symbol denotes. When developing the signs, we took into account the nature of the activity of a particular object, previous experience in developing similar signs in various countries [14], special symbols, signs, drawings, and letters that visually inform and convey the meaning of this symbol.

Results

As a result of the conducted research, conditional values of 48 epidemiologically significant objects have been developed, including 14 veterinary, 17 agricultural, 7 municipal, and 10 other objects. To differentiate and quickly determine which group of objects a particular sign belongs to, each group of symbols has its color of the edging of the figure. The shape of all symbols was defined in the form of a quadrangle, with equal sides. The drawings inside the square reflect the characteristic features of each epidemiologically significant object.

The symbols of veterinary facilities are presented in the form of a quadrangle with a blue border (Figure 1). In total, 14 symbols have been developed for objects related to veterinary activities, including veterinary offices, clinics, pharmacies, laboratories, animal burial grounds, biothermal pits, etc.

Figure 1 – Symbol of veterinary epidemiologically significant facilities

Almost all designations of veterinary facilities are made on a white background, except for the designation of the animal burial ground, which is made on a brown background. This is done to distinguish between a cattle burial ground and an anthrax burial, which have the same pattern of identification but differ in the color of the pattern and the background substrate.

The symbols of agricultural objects also have the shape of a square but with a green border (Figure 2). All signs of this category are made on a white substrate. In total, 17 symbols have been developed for objects related to agricultural activities. This category includes livestock enterprises, enterprises for the production and processing of agricultural products, and places of slaughter of animals: slaughterhouses, sites, etc.

The symbols of livestock enterprises are indicated in the form of a graphic image of the type of animal to which a particular enterprise belongs. Enterprises producing and processing agricultural products are marked with stylized and graphic drawings of the corresponding products (cheese, milk, meat, canned food, etc.). The figures denoting various animal slaughter enterprises were left in the form of the same signs that were adopted in the veterinary service on the territory of the former Soviet Union.

Figure 2 – Symbol of agricultural epidemiologically significant objects

Communal facilities were designated in the form of a quadrangle with a yellow border (Figure 3).

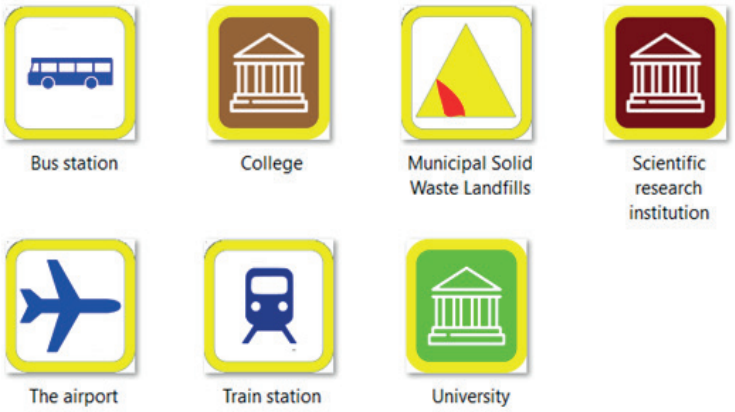

Figure 3 – Symbol of municipal epidemiologically significant facilities

At this stage, 7 conditional signs have been developed, but in the future, their number will be increased with the addition of new objects that will have epidemic significance. The symbols have been developed for the main transport hubs (railway station, bus station, airport), which are available in cities and large settlements and can have a significant impact on the epidemiological situation in the region for certain infections. A sign has also been defined to designate a solid waste landfill in the form of a stylized yellow triangle denoting waste recycling and covering the lower left part of the triangle with a stylized red flame denoting disposal. Signs of educational and scientific institutions (university, college, research organization) related to veterinary medicine, which can also affect the epidemiological situation, are designated in a single style, as a graphic representation of the facade of an ancient building, which in most cases is associated with an educational and scientific institution. At the same time, the sign of the university is full of green, the sign of the college on brown, and the sign of the research organization is on a dark burgundy background.

The symbols of other epidemiologically significant objects are also presented in the form of a quadrangle with a red border (Figure 4). At this stage, 10 symbols have been developed, but in practice, there may undoubtedly be more, so new signs for objects of this category will be added in the future. At this stage, signs have been developed for such facilities as zoos, nature reserves, hunting farms, nurseries, places for animal exhibitions, etc.

All designations of other epidemiologically significant objects are made on a white background, in the form of a graphic image or a stylized drawing denoting the activities of a particular enterprise or organization.

Figure 4 – Symbol of other epidemiologically significant objects

Discussion and Conclusion

Current areas of veterinary science include research on predicting the occurrence and spread of socially significant and hazardous infectious animal diseases. Often, epizootics of such infections pose a real threat to the health and life of the population and also lead to huge economic losses in agriculture.

The territory of Kazakhstan has historically been considered unfavorable for many diseases of infectious etiology common to humans and animals. And if some nosological forms have a natural focal character, then other diseases are anthropological, that is, the development of the epizootic process of such diseases depends directly on the activity of a person [4, 5, 15, 16]. In this regard, objects that a person uses in animal husbandry, in the processing of livestock products, may potentially turn out to be the link where the causative agent of the disease can be transmitted directly or through transmission factors to susceptible animals [2, 8, 17].

The practice of using symbols for veterinary facilities of epidemic importance was used earlier in the USSR and Russia [14]. To compile an epizootic map of a certain administrative unit (region, district), conventional signs of diseases of infectious etiology and veterinary facilities with epidemic significance were developed. But these signs are outdated and inapplicable in modern computer-analytical programs.

The development of such symbols requires their formativeness and the possibility of their application on various platforms (in particular, in ArcGIS) for their visualization, identification, and systematization.

The conducted research allowed us to develop 48 conditional definitions of epidemiologically significant facilities, including 14 veterinary, 17 agricultural, 7 municipal, and 10 other facilities. Primarily, symbols were developed for those objects that can have the greatest impact on the epizootic process of a particular disease of infectious etiology. Undoubtedly, this work will continue and in connection with the development and diversification of the livestock industry, the changing market conditions of livestock products, and new facilities will appear for which symbols will be developed.

In practice, knowledge of the location and epidemiological characteristics of such facilities will allow the veterinary service of the subject and administrative districts to control and rationalize the program of animal husbandry improvement, to optimally distribute the means and efforts of veterinary services to prevent the introduction and spread of particularly dangerous animal diseases into the territory of the region, district or locality.

Veterinary facilities of epidemiological importance require strict accounting and control over their sanitary and epidemiological condition. Since such objects constantly carry a potential threat of the emergence and spread of diseases of infectious etiology, dangerous for both animals and humans. The developed symbols are classified into four categories of objects: veterinary, agricultural, communal, and others.

These symbols will make it possible to use information and communication technologies more effectively to predict and assess the risk of the spread of the most relevant diseases of infectious etiology for our country, which in the future will allow for more effective preventive and anti-epizootic measures.

Authors' Contributions

YM and SA developed the concept and design of the study. AM and AA conducted a comprehensive literature search, analyzed the collected data, and drafted the manuscript. SA and MB: Performed final revision and proofreading of the manuscript. All authors have read, reviewed, and approved the final manuscript.

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