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АНАЛИЗ СТАТИСТИЧЕСКИХ ДАННЫХ ТЕХНОГЕННОГО ЗАГРЯЗНЕНИЯ КОСТАНАЙСКОЙ ОБЛАСТИ И ЕГО ВЛИЯНИЕ НА ЗАБОЛЕВАЕМОСТЬ ТЕЛЯТ ЖЕЛУДОЧНО-КИШЕЧНОГО ТРАКТА

Аннотация. *Статья раскрывает проблемы влияния техногенного загрязнения на развитие болезней желудочно-кишечного тракта молодняка крупного рогатого скота на территории Костанайской области. Загрязнение воздушного бассейна и почвы Костанайской области обусловлено выбросами загрязняющих веществ и захоронений отходов. Содержание тяжелых металлов в почвах области находится в допустимых показателях ПДК, накапливаясь в организме животных, они снижают иммунитет телят. Статистические данные летальности телят от желудочно-кишечных болезней, в разрезе возрастных групп животных указывают на то, что наибольшее количество падежа происходит период от 30 до 60 дней (40,8 %), наименьшее количество летальности – в возрасте 60–90 дней (5,2 %).*

Ключевые слова*: статистика, техногенное загрязнение, телята, болезни желудочно-кишечного тракта.*

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ANALYSIS OF STATISTICAL DATA ON MAN-MADE POLLUTION IN KOSTANAY REGION AND ITS IMPACT ON CALF REARING

Annotation*. The article reveals the problems of the influence of technogenic pollution on the development of gastrointestinal diseases of young cattle in the Kostanay region. Pollution of the air basin and soil of the Kostanay region is caused by emissions of pollutants and waste disposal. The content of heavy metals in the soils of the region is within the permissible MPC, accumulating in the body of animals, they reduce the immunity of calves. Statistical data on calf mortality from gastrointestinal diseases, in terms of age groups of animals indicate that the greatest number of deaths occurs in the period from 30 to 60 days (40.8%), the least number of deaths - at the age of 60-90 days (5.2%).*

Key words*: statistics, man-made pollution, calves, gastrointestinal diseases.*

Introduction. Human economic activity increases the technogenic impact on the environment, in particular, agroecosystems [1,4,5]. When raising livestock in technogenically contaminated areas, animals are exposed to not only physical and chemical factors, but also biological factors [3, 6]. Large areas of agricultural land are contaminated with heavy metals, pesticides, and household waste [1, 4, 7]. Toxic substances, getting into the soil, are absorbed by plants and then eaten by animals [8, 9]. Toxic substances enter the human body through livestock and plant products [4, 10]. With the constant intake of heavy metals into the body of animals through the alimentary route, they accumulate in organs and tissues, which leads to the formation of prerequisites for non-communicable diseases and a decrease in the animal's immunity [11, 12]. Abnormal levels of heavy metals lead to dysfunction of the kidneys, liver, cardiovascular system and the emergence of endemic diseases. With increased levels of lead, zinc and aluminum, calves show signs of osteodystrophy and the liver enlarges [6, 13, 14]. Long-term exposure leads to dysfunction of the gastrointestinal tract, stillbirth and high mortality of calves during the milk period. This occurs due to a weakening of the immune system, decreased resistance to pathogens, which makes them susceptible to infectious diseases [6, 13]. Metal toxicity also leads to disruption of the immune and reproductive systems in young bulls and infertility in females [11, 12, 15]. Research conducted by a number of scientists has revealed a relationship between the use of trace elements of heavy metals in feed, and reduced resistance in calves to infectious diseases and gastrointestinal diseases, as well as to treatment with antibacterial drugs [3,7].

Materials and methods. Retrospective analysis of pollutant emissions into the atmosphere in the Kostanay region from stationary sources was conducted by the RGU "Department of Ecology in the Kostanay Region, Committee for Environmental Regulation and Control of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan", analysis of gastrointestinal diseases of young cattle in the Kostanay region was carried out according to statistical reporting data of the "Veterinary Department of the Kostanay Region".

Own research. Periodic excess of sulfur dioxide, nitrogen dioxide, dust, and carbon monoxide is observed in the atmospheric air of the Kostanay region. The region's atmosphere is polluted by the mining industry of the region, represented by large enterprises for the extraction of iron ore and the production of iron ore pellets: Rudny and Lisakovsky. Non-ferrous metallurgy enterprises include Krasnooktyabrskoye and Turgay bauxite mines, «Aluminum of Kazakhstan», «Shaimarden» of the Kamystinsky district (zinc, nickel), «Metal-Trading» of Zhitikara, «Varvarinskoye» of the Taranovsky district (gold, copper), etc. as well as from motor vehicles and landfills of waste overburden, ash and slag, pesticides, expired medicines, agricultural pesticides, chemical reagents, mercury-containing waste, dioxins and other poisons. The total volume of waste disposed of and buried in the Kostanay region amounted to 111,199 tons. A retrospective analysis of the emission of pollutants into the atmosphere from stationary sources was conducted by the RGU "Department of Ecology for Kostanay Region, Committee for Environmental Regulation and Control of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan" (*Figure 1*).

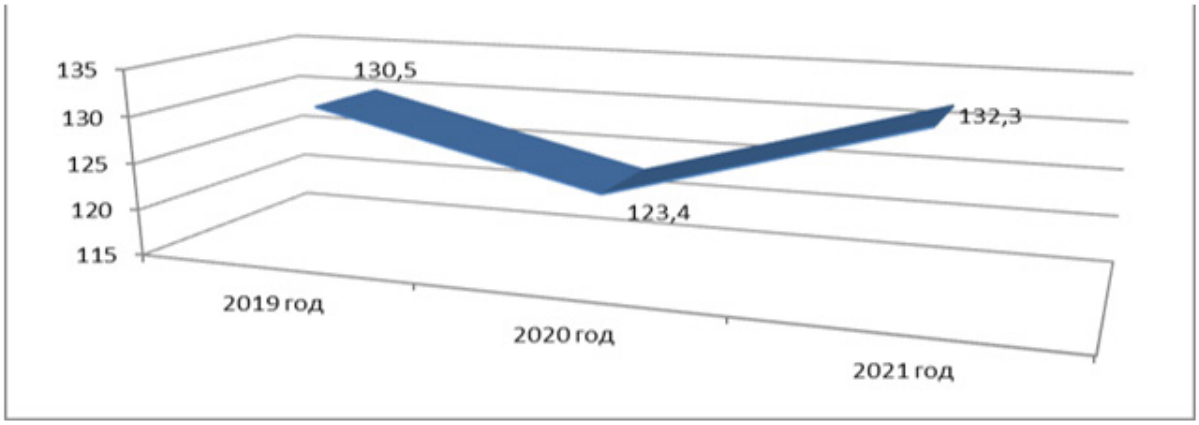


Figure 1 – Emission of pollutants into the atmosphere from stationary sources in Kostanay region.

According to statistics, stationary sources of pollution emitted 386.2 thousand tons into the atmosphere in Kostanay region. The largest volumes of pollutant emissions are sulfur dioxide, carbon monoxide and nitrogen oxide. In terms of technogenic pollution, Kostanay region ranks 6th in Kazakhstan.

Due to the increasing scale of man-made pollution of the environment, special attention is paid to the control of the pollution of agricultural soils with heavy metals. Dioxins are a universal cellular poison and affect all species of animals and most plants. These poisons are resistant to chemical and biological decomposition, remain in the environment for decades and are easily transferred through food chains. Plants accumulate heavy metals and are an intermediate link in the chain: soil - plant - animal - human. The territory of Kostanay region is influenced by the state of neighboring cities (Chelyabinsk, Tyumen, Karaganda) depending on climatic and meteorological conditions that determine the extent of the atmosphere's ability to disperse emissions of harmful substances or form the level of impurity concentration in the ground layer.

In the Kostanay region, in agronomic terms, arable soils are highly and moderately provided with exchangeable cadmium, low and moderately - with mobile phosphorus, the content of heavy metals has acceptable indicators according to MAC. Despite the fact that the indicators are in the reference ranges, metals tend to accumulate in the organs and bones of animals and the period of their elimination is at least 10 years. The animal's immunity gradually decreases, and it becomes susceptible to diseases.

An analysis of the causes of death of young cattle in the Kostanay region showed that out of 502,290 heads of newborn calves, 3,900 died from diseases of gastrointestinal etiology, the mortality rate was on average 0.9%. Based on the study of statistical data from official veterinary reports, an analysis of morbidity and mortality due to gastrointestinal etiology was carried out by age groups of animals. Thus, out of 502,290 heads of examined calves aged 1–30 days, 12,157 heads (62.1%) of animals with gastrointestinal diseases were identified, the mortality rate was 2,853 heads (23.4%). The largest number of calves with gastrointestinal diseases

(70.9%) was identified in 2021, and the largest number of dead calves (30.4%) occurred in 2019. In the group of calves aged 30–60 days, out of 482,720 animals examined, 7,666 animals (1.58%) were found to be sick. Of these, gastrointestinal pathology was diagnosed in 4,021 animals (52.45%), and the mortality rate was 1,381 animals (34.3%). The largest number of calves with gastrointestinal diseases (62.1%) and dead calves (40.8%) were identified in 2021. In the group of calves aged 60–90 days, out of 475,054 examined heads, 1,757 animals (74.9%) were identified with gastrointestinal diseases, the mortality rate was 79 heads (4.4%). The highest number of cases of gastrointestinal diseases (94.6%) and dead calves (5.2%) were identified in 2019 (*Figure 2*).

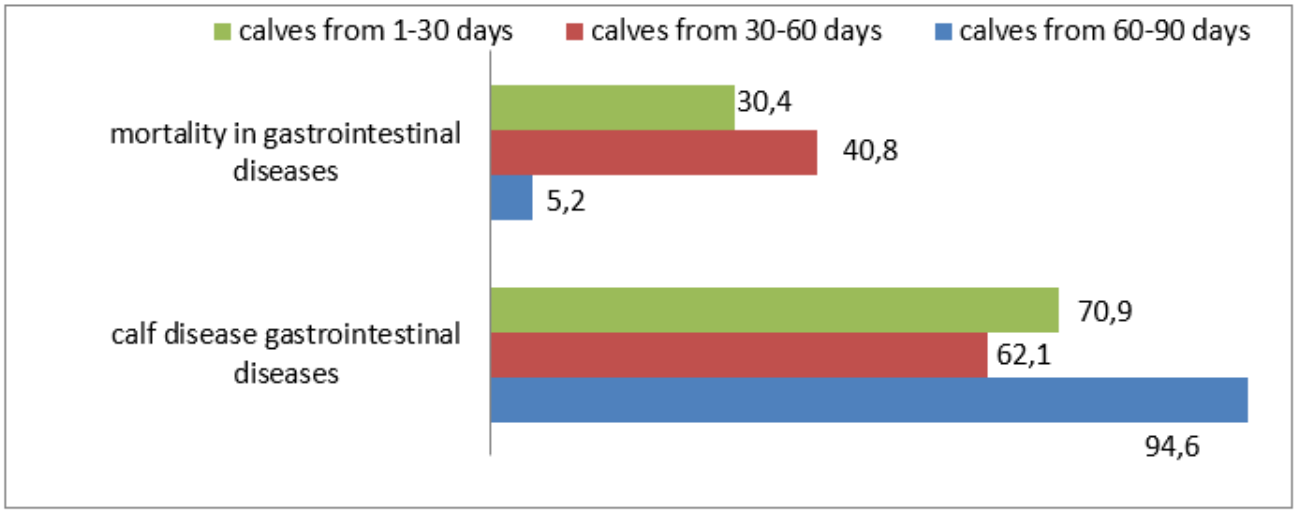


Figure 2 – Incidence and mortality of newborn calves with gastrointestinal diseases by age for 2019–2021.

The highest percentage of susceptibility to gastrointestinal diseases is demonstrated by calves aged 1 to 30 days (70.9%). At the age of 30 to 60 days, there is a decrease to 62.1%, and in the age period from 60 to 90 days, the incidence again increases to 94.6%. Statistical data on calf mortality by age groups of animals indicate that the greatest number of deaths occurs in the period from 30 to 60 days (40.8%), the lowest number of deaths - at the age of 60-90 days (5.2%).

Conclusion. Pollution of the air basin and soil of the Kostanay region is caused by emissions of pollutants and waste disposal. In the soils of the Kostanay region, the content of heavy metals has acceptable levels according to MPC, accumulating in the body of animals, reducing their immunity. Statistical data on the mortality of calves from gastrointestinal diseases, in terms of age groups of animals indicate that the greatest number of deaths occurs in the period from 30 to 60 days (40.8%), the least number of deaths - at the age of 60-90 days (5.2%).

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