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Hygienic principles of working conditions in modern livestock complexes

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ABSTRACT

Introduction. This study discusses the importance of adhering to hygienic principles to ensure comfortable and safe working conditions for employees in modern livestock complexes. To achieve high productivity in animal husbandry, it is essential that the working environment meets sanitary and hygienic requirements.

Materials and Methods. The hygienic assessment of working conditions for employees in modern livestock complexes and the development of measures to improve the working process utilized hygienic, sanitary-chemical, physiological, and statistical research methods.

Results. Working conditions in modern livestock complexes are characterized by numerous factors that affect the health of workers. Employment in this field requires compliance with various sanitary and hygienic norms. Any deviation from these requirements can lead to the development of occupational diseases or a decrease in labor productivity. Below, the working conditions in animal husbandry and the results of their assessment based on hygienic principles are described.

Conclusion. Strict adherence to sanitary and hygienic regulations is of paramount importance for protecting the health of workers in livestock complexes. Preventing harmful factors at early stages and reducing them to a minimal level can decrease morbidity and improve working conditions. The organization of medical examinations and regular training for employees enhances the effectiveness of preventive measures.

Keywords: Livestock complexes; working conditions; sanitary-hygienic norms; occupational diseases; microclimate; prevention; medical examination; health of workers

Compliance with ethical standards. The study does not require the submission of the conclusion of the biomedical ethics committee or other documents.

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Условия труда в современных животноводческих комплексах

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РЕЗЮМЕ

Введение. В данном исследовании обсуждается важность соблюдения гигиенических принципов для обеспечения комфортных и безопасных условий труда работников в современных животноводческих комплексах. Для достижения высокой продуктивности в животноводстве важно, чтобы рабочая среда соответствовала санитарно-гигиеническим требованиям.

Материалы и методы. При гигиенической оценке условий труда работников современных животноводческих комплексов и разработке мероприятий по оздоровлению рабочего процесса использовались гигиенические, санитарно-химические, физиологические и статистические методы исследования.

Результаты. Условия труда в современных животноводческих комплексах характеризуются множеством факторов, влияющих на здоровье работников. Работа в этой сфере требует соблюдения санитарно-гигиенических норм. Любое отклонение от этих требований может привести к развитию профессиональных болезней или снижению производительности труда. Ниже описаны условия труда в животноводстве и результаты их оценки на основе гигиенических принципов.

Ограничения исследования. В исследовании рассматриваются только определённые факторы, такие как качество воздуха, шум, освещённость, микроклимат и другие конкретные условия. Изучение всех аспектов рабочего процесса затруднено.

Заключение. В животноводческих комплексах строгое соблюдение санитарно-гигиенических правил имеет важнейшее значение для охраны здоровья работников. Предупреждение влияния вредных факторов и снижение их до минимального уровня позволяет уменьшить заболеваемость и улучшить условия труда. Медицинские осмотры и регулярное обучение сотрудников повышают эффективность профилактических мер.

Ключевые слова: животноводческие комплексы; условия труда; санитарно-гигиенические нормы; профессиональные болезни; микроклимат; профилактика; медицинский осмотр; здоровье работников

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Introduction

The leading countries in the world are characterized by rapid growth in livestock sectors and the development of intensive technologies, increasing animal productivity and production levels. However, various problems hinder further acceleration in this field, including the adoption of modern technologies, modernization of production processes, and expansion of finished product exports.

The environmental impact of large livestock enterprises primarily manifests in two ways: air pollution from dust, microorganisms, and unpleasant odors near farms, and contamination from disinfectants, vaccines, and antibiotics used in livestock production [1].

Furthermore, the emergence of unpleasant odors from manure, waste, animal carcasses, and certain feeds presents significant challenges. These issues necessitate targeted research on the hygienic assessment of production processes in livestock complexes and the prevention of occupational diseases related to temporary loss of workers' ability to work [2].

Globally, numerous scientific studies focus on evaluating the working conditions of employees in modern livestock complexes and developing health improvement measures for production processes [3]. Such research is crucial for understanding the impact of physical, chemical, and biological factors on worker health indicators and assessing the distribution of waste released into the atmosphere in areas where modern livestock farms are located, along with developing sanitary and hygienic measures to protect workers' health [1, 2].

The hygienic assessment of working conditions in modern livestock complexes is of great importance. Studies conducted on this issue have analyzed the sanitary and hygienic conditions of the working environment in livestock complexes, identified major harmful factors, and developed measures to reduce their impact [4].

Precision Livestock Farming systems in dairy farming are considered an important solution for environmentally, economically, and socially sustainable production. This approach improves working conditions by optimizing animal care processes [5].

Additionally, studies have examined the impact of livestock complexes on the environment, particularly on the atmosphere, emphasizing the need for strict adherence to hygienic standards to reduce air pollution. Furthermore, implementing advanced technologies, strengthening hygienic control, and improving sanitary-hygienic conditions in workplaces are essential for creating a healthy working environment in modern livestock complexes [6].

Research purpose. The aim is to thoroughly examine the working conditions of employees in modern livestock complexes and identify the factors affecting their health, thereby developing methods to ensure a working environment that meets hygienic requirements.

Research Objectives:

- Analyze the physical, chemical, biological, and psychological factors affecting workers' activities.
- Study sanitary and hygiene requirements, including air humidity, temperature, dust, gases, and noise levels.

Materials and Methods

The hygienic assessment of working conditions for employees in modern livestock complexes and the development of measures to improve production processes have utilized hygienic, sanitary-chemical, physiological, and statistical research methods.

Results

The livestock complex "Otabek D" in the Shofirkon district is considered a modern complex in Bukhara region, specializing in breeding 1000 heads of Australian "Gold Semmental" cattle, employing a sequential technology approach: livestock care, calf rearing, milking, and meat production. According to the production process, livestock is divided into special sections based on their age, gender, and physiological condition.

The primary technology of the complex distinguishes between breeding, milking, and fattening cattle. In livestock complexes, the technological processes (feeding, watering, waste disposal, and veterinary treatments) are mechanized. Animals are watered using automated watering systems. The milking system is also automated, with only feeding and slaughtering performed manually [7, 8].

In livestock complexes, the feeding of animals is conducted according to a regulated regime. Waste water from the animal husbandry sector is disposed of through specially designed channels. Livestock care is organized into distinct groups. The number of workers in the groups is determined based on the number of livestock. The main production technology is based on feeding the animals.

Feeding the livestock is conducted as follows: the forage is brought in by machinery and distributed by the worker while the machinery is running. In this case, the worker is subjected to significant physical strain. The worker's posture becomes forced, leading to physical strain on the muscles of the arms, shoulders, and legs [9, 10].

Additionally, during the forage distribution process, there is a high level of dust around the respiratory system of workers. The dust is primarily composed of plant particles. In open and closed buildings of the complexes, the removal of manure and urine is carried out with the help of conveyors, and the placement of these materials onto the conveyor is done manually by workers. In such cases, the workers are in a forced position, resulting in significant physical strain on their muscles.

In the calf rearing section, workers categorize the animals based on their physical condition. Also, animals in poor condition or underweight are manually moved to an isolation area. Calves are moved to the vicinity of their mother cows for feeding, which is also done manually. In such situations, workers are in a forced position, leading to physical strain on the muscles of the shoulders, arms, and legs [11–13].

Furthermore, during the sorting process, there is increased pressure on the sensory organs of the workers. The milking section predominantly employs women. In this section, placing the device on the cows and removing it after milking is done manually. During this process, women are in forced postures, leading to physical strain on their shoulder, arm, and leg muscles. Also, female workers experience pressure on their sensory organs.

The slaughtering of large animals is carried out in a special slaughterhouse. The walls of the slaughterhouse are tiled, and the ceiling is painted with oil paint. A special pit is designated for cutting the animal's head. The blood flows into a separate channel leading to a designated area.

The slaughtering process is performed manually. The animals are knocked down, and their heads are cut off, as well as the skinning, all done manually. In this process, butchers experience significant physical strain, often finding themselves in forced postures, leading to physical pressure on the muscles of the arms, shoulders, and legs.

Additionally, cutting the animal's head, skinning, and cleaning the internal organs all require strong pressure on the sensory organs of the butchers.

Alongside these factors, butchers are also exposed to various harmful biological factors (bacteria, viruses, parasites). Injuries of various kinds are inevitable among the workers in this section (such as cutting fingers, injuring arms and legs).

The complex's feed preparation section is located in a separate building. In this section, the necessary ingredients for feed preparation are manually lifted into the hopper. This creates static and dynamic pressure on the workers.

Our inspections have shown that chemical substances are among the harmful factors affecting the workers in these livestock complexes. The air in the buildings of the livestock complexes becomes contaminated with gas mixtures produced from the decay and decomposition of manure.

In the rooms where livestock are kept, unpleasant odors in the air are caused by hydrogen sulfide and ammonia, methyl mercaptan, indole, gas, and amines.

Table 1 / Таблица 1

Microclimate indicators in the main sections of the livestock complex (average values)**Параметры микроклимата в основных отделах животноводческого комплекса (средние значения)**

Inspected Sections Исучаемые отелы	Microclimate Parameters Параметры микроклимата	Microclimate in the warm season Микроклимат в тёплый период года		Microclimate in the cold season Микроклимат в холодный период года	
		животноводческий комплекс / livestock complex			
		“Otabek D” «Отабек Д»	“Hastinapur” «Хастинапур»	“Otabek D” «Отабек Д»	“Hastinapur” «Хастинапур»
Closed building for dairy and beef cattle Закрытое помещение для содержания молочного и мясного скота	Temperature, °C Температура, °C	+35.0 ± 0.9	+38.1 ± 1.1	5.47 ± 0.9	3.8 ± 0.9
	Humidity, % Влажность, %	60.0 ± 1.7	55.0 ± 1.5	80.0 ± 0.9	85.0 ± 0.9
	Air Velocity m/s Скорость воздуха, м/с	0.4 ± 0.03	0.3 ± 0.03	0.5 ± 0.1	0.4 ± 0.02
Open building for dairy and beef cattle Открытое помещение для содержания молочного и мясного скота	Temperature, °C Температура, °C	+38.0 ± 0.9	+39.1 ± 1.1	—	—
	Humidity, % Влажность, %	53.0 ± 1.1	57.2 ± 1.2	—	—
	Air Velocity m/s Скорость воздуха, м/с	0.2 ± 0.02	0.2 ± 0.03	—	—
Closed section for raising calves Закрытое отделение для содержания телят	Temperature, °C Температура, °C	34.0 ± 0.7	33.0 ± 0.8	+10.0 ± 0.7	+13.0 ± 0.9
	Humidity, % Влажность, %	32.0 ± 1.0	32.0 ± 1.1	60.0 ± 0.9	60.0 ± 0.8
	Air Velocity m/s Скорость воздуха, м/с	0.2 ± 0.04	0.2 ± 0.05	0.2 ± 0.04	0.2 ± 0.03
Closed building for the calving section Закрытое помещение для родов	Temperature, °C Температура, °C	36.0 ± 1.2	38.0 ± 1.3	10.5 ± 0.8	11.5 ± 0.9
	Humidity, % Влажность, %	58.0 ± 0.8	60.0 ± 0.9	80.0 ± 0.9	80.0 ± 0.9
	Air Velocity m/s Скорость воздуха, м/с	0.2 ± 0.04	0.2 ± 0.03	0.4 ± 0.04	0.4 ± 0.04
Slaughterhouse Бойня	Temperature, °C Температура, °C	+34.0 ± 0.7	30.0 ± 0.8	4.2 ± 0.8	4.9 ± 0.9
	Humidity, % Влажность, %	78.0 ± 1.3	79.0 ± 1.4	95.0 ± 1.2	96.0 ± 1.4
	Air Velocity m/s Скорость воздуха, м/с	0.2 ± 0.04	0.3 ± 0.05	0.3 ± 0.05	0.4 ± 0.04

When checking the microclimate parameters in the main production sections of livestock farming, various indicators for air temperature, humidity, and air movement velocity were recorded during the hot and cold months of the year (see Table 1).

In the «Otabek D» and «Hastinapur» livestock complexes, the air temperature in the closed buildings for dairy and beef cattle during the cold season changed by 143.9%, while the humidity ratio changed by 94.1%, and the air movement speed changed by 125%. In the closed section for raising calves, the air temperature changed by 76.9%, while the humidity ratio and air movement speed remained unchanged. In the closed building of the calving section, the air temperature changed by 91.3%, while the humidity ratio and air movement speed remained unchanged. In the slaughterhouse section, the air temperature changed by 85.7%, while the humidity ratio changed by 98.9%, and the air movement speed changed by 75%.

In the closed buildings for dairy and beef cattle during the warm season, the air temperature in the «Otabek D» and «Hastinapur» livestock complexes changed by 91.7%, while the humidity ratio changed by 109%, and the air movement speed changed by 133%. In the open buildings for dairy and beef cattle, the results indicated that the air temperature changed by 97.2%, the humidity ratio changed by 92.6%, and the air movement speed changed by 95.6%.

In the closed section for raising calves, the air temperature changed by 103%, the humidity ratio changed by 99.6%, and the air movement speed changed by 0.96%. In the closed building of the calving section, the air temperature changed by 94.7%, the humidity ratio changed by 96.6%, and the air movement speed changed by 104%. In the slaughterhouse section, the air temperature changed by 113%, the humidity ratio changed by 98.7%, and the air movement speed changed by 66.6%.

As reflected in Table 3.1 above, various microclimate parameters were observed in the main sections of the complex. The differences in microclimate parameters in different buildings are related to the number of livestock raised in the sections, the quality and type of cleaning the rooms from manure and urine, the hermetic nature of the buildings, and the effectiveness of the ventilation systems.

Moreover, in the closed and open buildings for dairy and beef cattle in the «Otabek D» and «Hastinapur» livestock complexes, it was recorded that in the cold season, the average temperature was low in both complexes (-6.8 ± 0.9 °C), while in the warm season, it was averaged (36.55 ± 1.1 °C). The same situation is observed in the humidity levels, meaning that keeping the buildings closed during the cold season caused an increase in humidity levels ($85 \pm 0.8\%$).

In the closed building for raising calves, the effective functioning of the deflectors resulted in microclimate parameters being below the established norms in both winter and summer. In the slaughterhouse during the cold season, the temperature was 27.4–28.8% below the norm. The continuous washing of waste, such as blood and internal organs, with water in the room resulted in humidity being 1.26–1.28 times higher than the norm during the cold season, and during the warm season, it was found that humidity levels were maintained at 1.73–1.75 times higher levels.

One of the factors negatively affecting the health of workers in livestock farms is dust. Inspections revealed that the amount of dust was high in all sections of the complex (except for the section where calves are raised) (see Table 2). The numbers in the table above show that the amount of dust in the different sections of the livestock complex is not uniform (see Table 2).

The amount of dust detected in the workplaces of the «Otabek D» livestock complex, closed building for keeping livestock, open building for keeping livestock, closed maternity ward, closed building for keeping calves, open building for keeping calves, workshop for making fodder, in the respiratory organs of workers when distributing coarse hay to livestock around.

The amount of dust determined in the workplaces of «Hastinapur» cattle breeding complex, closed building for keeping livestock, open building for keeping livestock, closed birthing department, closed building for keeping calves, open building for keeping calves, workshop for preparing fodder, workers around the respiratory organs when distributing rough hay to livestock.

The composition of the dust generated during the technological process in the complex departments is an example of coarse hay, soft feed, skin epithelium, cattle wool.

Table 2 / Таблица 2

Dust levels in livestock complex workplaces, mg/m³Концентрация (мг/м³) пыли на рабочих местах в животноводческом комплексе

Source of Inspection Объект проверки	Permissible Dust Concentration Norm Допустимая концентрация пыли	«Dust Levels in "Otabek D" Livestock Complex Workplaces Концентрация пыли на рабочем месте в комплексе «Отабек Д»	Dust Levels in "Hastinapur" Livestock Complex Workplaces Концентрация пыли на рабочем месте в комплексе «Хастинапур»
Closed building for livestock Закрытое помещение для содержания скота	4.0	9.2 ± 0.7	10.2 ± 0.9
Open building for livestock Открытое помещение для содержания скота	4.0	6.5 ± 0.5	7.4 ± 0.7
Closed calving section Закрытое родильное отделение	4.0	8.6 ± 0.6	8.8 ± 0.7
Closed building for raising calves Закрытое помещение для содержания телят	4.0	4.8 ± 0.2	4.1 ± 0.3
Open building for raising calves Открытое помещение для содержания телят	4.0	4.2 ± 0.3	3.5 ± 0.2
Compound feed preparation workshop Цех приготовления комбикорма	4.0	10.6 ± 0.5	12.6 ± 0.7
Workers around respiratory organs while distributing rough feed Зона вентиляции для защиты органов дыхания работников при расфасовке грубого корма	4.0	7.6 ± 0.4	10.4 ± 0.7

Organic substances contained in dust can increase the sensitivity (sensitization) of workers' bodies and cause them to develop allergic diseases.

The highest dust was recorded around the respiratory organs of the workers during the distribution of coarse hay (10.4 ± 0.7 mg/m³) and in the forage preparation workshop (12.6 ± 0.7 mg/m³).

"Otabek D" and "Hastinapur" animal husbandry complex, the amount of dust detected in the workplaces of the closed building where livestock is kept is 2.3–2.55 times higher than the standard level, the open building where livestock is kept is 1.62–18.5 times higher, the closed maternity ward 2.15–2.2 times, the closed building for keeping calves is 1.2–1.02 times, the open building for keeping calves is 1.05–0.87 times, the soft fodder preparation shop is 2.65–3.15 times, rough for livestock. In the distribution of hay, the respiratory organs of the workers were found to be 1.9–2.6 times higher.

It was observed that the amount of dust in the air of workplaces in the indoor and outdoor building of the young calf keeping department did not exceed Permissible standard (Table 2).

The measurement of noise level in the main departments of the inspected livestock complex gave the following results (see Table 3).

The noise level recorded at workplaces in the closed dairy and meat cattle building of the "Otabek D" livestock complex is 0.88–1.1 times, the closed building where calves are kept is 0.875–1.025 times, and the fodder preparation workshop is 1.1–1.15 times, it was observed that the poultry house increased 1,025–1,075 times.

It was observed that the noise level did not exceed the established norm in the calf keeping workshop.

It was found that the operation of equipment installed in the compound feed production workshop increased the noise level by 110–118%. In the cowshed, during the process of milking cattle, the noise level reached 84–89 dB and was 1,025–1,075 times higher than the permissible limit.

In the "Hastinapur" livestock complex, the recorded noise levels in the closed building for dairy and meat livestock ranged from 0.975 to 1.075 times above the standard. In the closed building for calves, the noise level was recorded at 0.875 to 1.012 times above the standard. In the compound feed preparation workshop, the noise levels increased to 1.12 to 1.18 times above the standard, while the cattle shed showed an increase of 1.05 to 1.11 times above the standard.

It was also observed that the noise levels in the calf housing workshop at the "Hastinapur" livestock complex did not exceed the established standards.

In the compound feed preparation workshop, it was found that the noise levels increased by 112–115% due to the operation of the installed equipment. In the cattle shed, during the process of washing the animals, the noise levels ranged from 84 to 89 dB, exceeding the allowed limit by 1.05 to 1.11%.

It should be noted that the impact of noise on workers in the main workshops of the facility lasts approximately 1.0 to 1.5 hours. In the compound feed preparation workshop, the noise affects workers for 5.0 to 5.5 hours, while in the cattle shed, it lasts for 4.0 to 5.0 hours (according to time measurement results).

We detected hydrogen sulfide, ammonia, and methyl mercaptan in the air of the working areas (see Figure on the insert). The concentrations of harmful substances in the air of the main working areas of the "Otabek D" and "Hastinapur" livestock complexes are presented in Table 3, 4.

From the figures in the table, it is evident that the levels of the gases mentioned above were found to be higher than the established limits. However, it was noted that the gas concentrations in the calf housing zone did not exceed the designated standards.

In the closed rooms and open yards where dairy cattle are kept, the ammonia levels increased by 1.1 and 1.3 times, respectively; the levels of methyl mercaptan increased by 0.9 and 1.2 times; and the levels of hydrogen sulfide increased by 0.8 and 1.0 times.

The harmful substances in the air of the main working areas of the "Otabek D" and "Hastinapur" livestock complexes—hydrogen sulfide, methyl mercaptan, and ammonia—primarily originate from the decomposition of manure and feed residues. The air in the livestock housing areas is mainly contaminated with hydrogen sulfide, ammonia, methyl mercaptan, carbon monoxide, indole, and amines.

In closed buildings, the concentrations of hydrogen sulfide, methyl mercaptan, and ammonia were observed to be particularly high in the early hours of the morning. This situation is related to the low ventilation due to the buildings being sealed in the evening.

It is important to emphasize that while the concentrations of hydrogen sulfide, methyl mercaptan, and ammonia in open yards are somewhat lower compared to closed rooms, their levels are still above the permitted limits.

It was found that the amount of hydrogen sulfide in the closed livestock buildings of the "Otabek D" and "Hastinapur" livestock complexes exceeded the permissible limits by 1.51–1.43 times at the workers' workplaces. Similarly, methyl mercaptan exceeded the permissible levels by 1.5–2.0 times, and ammonia by 1.46 times. In the open livestock buildings, hydrogen sulfide was found to be 1.22–1.38 times higher, methyl mercaptan 1.25–1.5 times higher, and ammonia 1.22–1.3 times higher than the standard limits.

Table 3 / Таблица 3

Indicators of noise levels in livestock complex sections, dB

Показатели уровня шума (дБ) в отделах животноводческого комплекса

Source of Inspection Объект проверки	Noise Level Standard Норматив уровня шума	Recorded Noise Level in "Otabek D" Livestock Complex Уровень шума в рабочих местах животноводческого комплекса «Отабек Д»	Recorded Noise Level in "Hastinapur" Livestock Complex Уровень шума в рабочих местах животноводческого комплекса «Хастинапур»
Closed Building for Dairy and Meat Livestock Закрытое помещение для содержания молочного и мясного скота	80	71–88	78–86
Closed Building for Calves Закрытое помещение для содержания телят	80	70–82	70–81
Compound Feed Preparation Workshop Цех по приготовлению комбикорма	80	88–92	90–95
Slaughterhouse Бойня	80	82–86	84–89

Table 4 / Таблица 4

The level of bacterial air pollution of the main departments of livestock complexes CFU/m³ (average amount)Уровень бактериального загрязнения воздуха в основных отделах животноводческих комплексов КОЕ/м³ (среднее значение)

Building Name Название зданий	Bacterial Count in 1m ³ Air / Количество бактерий в 1 м ³ воздуха			
	"Otabek D" Livestock Complex на рабочих местах животноводческого комплекса «Отабек Д»		"Hastinapur" Livestock Complex на рабочих местах животноводческого комплекса «Хастинапур»	
	Total Bacteria	<i>Staphylococcus</i>	Total Bacteria	<i>Staphylococcus</i>
Dairy Cows Building Здание для содержания дойных коров	16 500	4985	16 450	4816
Calf Housing Building Здание для содержания телят	12 600	6840	12 746	6835
Beef Cattle Housing Building Здание для содержания мясных коров	18 580	8780	17 460	8460
Maternity Ward Родильное отделение	19 700	9160	19 735	9215
Slaughterhouse Бойня	18 410	7960	15 315	6520

In the closed maternity section, hydrogen sulfide exceeded permissible limits by 1.69–1.59 times, methyl mercaptan by 1.75–2.0 times, and ammonia by 1.51–1.61 times. Meanwhile, in the compound feed preparation workshop, hydrogen sulfide was recorded at 1.04–0.92 times, and methyl mercaptan was found to be 0.5–0.62 times below the limit, with ammonia not detected.

Along with the physicochemical factors negatively affecting workers' health, microbial contamination of the air plays an important role in livestock complexes. The degree of microbial air contamination depends on the number of livestock and their living conditions. The level of bacterial contamination in the air and workplaces of the complexes was assessed based on the sanitary norms (No. 0053–23 sanitary rules and norms) for harmful and dangerous substances, microorganisms, bacterial preparations, and aerosols in residential areas. According to these norms, the permitted number of colony-forming microorganisms ranges between 50,000 and 100,000, depending on the number of animals and the sanitation conditions of the rooms.

Our inspections found that the level of saprophytic bacteria in the air of the main sections of the farms did not exceed the set norms. However, the number of cocci-shaped bacteria was recorded in production areas. In the air of the building housing beef cattle, the amount reached (16,500 ± 1,180 CFU/m³), which is 2.7 times above the standard, comprising 31.1–66.6% and 21.8–60.2% of the total microbial content. In the rooms housing dairy cows, hemolytic *Staphylococcus* was found in 1.6–10.2% of cases (85–491 CFU/m³), and molds were detected in 30.2% of cases.

The indicators of microflora in the air of the main sections of livestock complexes are shown in Table 4. The poor sanitary condition of farm rooms increases the number of yeast-like fungi in the air, which can cause increased sensitivity (sensitization) in workers.

In the building where calves are housed, actinomycetes were predominantly found (48.1% of positive samples). We believe this is due to the high physical activity of calves and the high bacterial contamination of the air in the rooms.

This table shows the bacterial counts for air samples from different buildings of the "Otabek D" and "Hastinapur" livestock complexes. The results indicate the concentration of total bacteria and staphylococcus in the air at the workers' workplaces. Notably, the maternity ward and beef cattle housing buildings exhibit the highest bacterial counts.

Limitations. The study focuses only on specific factors such as air quality, noise, lighting, microclimate, and other particular conditions. Covering all aspects of the work process is challenging.

Discussion

The hygienic principles of working conditions in modern livestock complexes are crucial for ensuring the health and well-being of workers. Key aspects include evaluating physical, chemical, and biological factors. Additionally, compliance with sanitary-hygiene standards related to air quality, temperature, humidity, dust, gases, and noise levels is essential. These factors collectively contribute to preventing occupational diseases and enhancing overall productivity, highlighting the need for continuous monitoring and improvement of workplaces in the livestock sector. Implementing systematic hygiene practices can improve worker health and lead to more sustainable livestock production systems.

Conclusion

Working conditions in modern livestock complexes have a direct impact on the health of workers. Poorly organized conditions increase the risk of infectious diseases among employees and reduce work efficiency. Microclimate parameters-such as temperature, humidity, and air circulation-play a crucial role in ensuring both productivity and workers' well-being. Workers in livestock complexes are directly exposed to pathogenic microorganisms, allergens, and other biological hazards, which makes maintaining a healthy and safe working environment essential.

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(п.п. 1, 3–5, 7, 8, 11–13 см. References)

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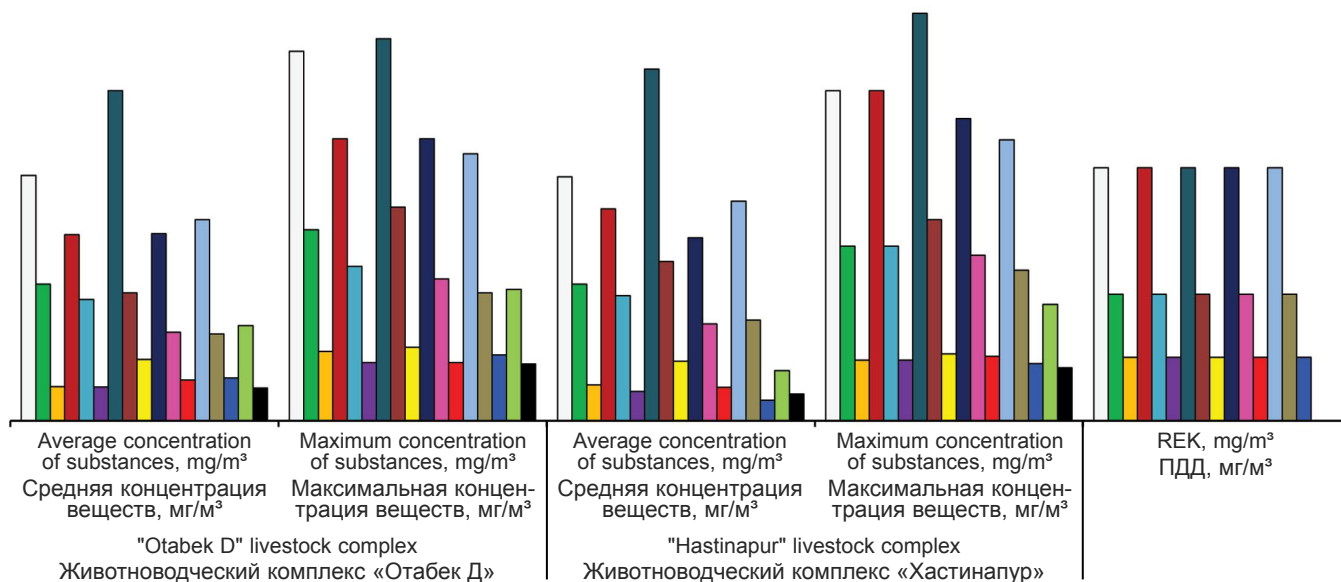
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К статье К.И. Иброхимова
To the article by Kamol I. Ibrohimov



Source of Inspection Объект проверки	Substances Вещество	"Otabek D" livestock complex Комплекс «Отабек Д»		"Hastinapur" livestock complex Комплекс «Хастинапур»		REK, mg/m³ ПДД, мг/м³
		concentration of Substances, mg/m³ концентрация веществ, мг/м³				
		average средняя	maximum максимальная	average средняя	maximum максимальная	
A closed building for the storage of livestock Закрытое помещение для содержания скота	 Ammonia / Аммиак	19.4	29.2	19.3	26.1	20
	 Hydrogen sulfide / Сероводород	10.8	15.1	10.8	13.8	10
	 Carbon monoxide / Окись углерода	2.7	5.48	2.83	4.8	5
An open building for the storage of livestock Открытое помещение для содержания скота	 Ammonia / Аммиак	14.7	22.3	16.76	26.1	20
	 Hydrogen sulfide / Сероводород	9.6	12.2	9.9	13.8	10
	 Carbon monoxide / Окись углерода	2.67	4.6	2.32	4.8	5
Closed maternity ward Закрытое родильное отделение	 Ammonia / Аммиак	26.1	30.2	27.8	32.2	20
	 Hydrogen sulfide / Сероводород	10.1	16.9	12.6	15.9	10
	 Carbon monoxide / Окись углерода	4.85	5.8	4.7	5.3	5
A closed building where calves are kept Закрытое помещение для содержания телят	 Ammonia / Аммиак	14.8	22.3	14.46	23.9	20
	 Hydrogen sulfide / Сероводород	7.0	11.2	7.65	13.1	10
	 Carbon monoxide / Окись углерода	3.22	4.6	2.65	5.1	5
An open building where calves are kept Открытое помещение для содержания телят	 Ammonia / Аммиак	15.9	21.1	17.36	22.2	20
	 Hydrogen sulfide / Сероводород	6.85	10.1	7.95	11.9	10
	 Carbon monoxide / Окись углерода	3.39	5.2	1.62	4.53	5
Omukhta fodder preparation shop Цех по изготовлению комбикорма	 Hydrogen sulfide / Сероводород	7.51	10.4	3.97	9.2	—
	 Carbon monoxide / Окись углерода	2.58	2.13	2.13	4.2	—

Amount of Chemical Substances at Workplaces.
 Содержание химических веществ в воздухе рабочей зоны.