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ANIMAL WELFARE IN THE CONTEXT OF BIOETHICAL PRINCIPLES AND BIOSAFETY

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Annotation. The article discusses modern approaches to understanding animal welfare as an interdisciplinary phenomenon that encompasses physiological, behavioral and ethical aspects of human-animal interaction. It is noted that animal welfare has gained wide recognition as a separate scientific discipline, and its importance goes far beyond veterinary medicine, covering environmental, social and bioethical dimensions. The article examines international legal approaches to regulating animal welfare, with a particular focus on European models, where animal protection is often integrated into basic legislation. Particular attention is paid to the role of education in shaping a humane attitude towards animals: the potential of educational programs and courses on animal welfare is revealed, as well as the impact of content and teaching approaches on the formation of values in future professionals. The author emphasizes the need to develop scientific research aimed at creating objective, scientifically based methods for assessing the condition of animals. Promising areas in the study of animal welfare are methods based on the analysis of biochemical parameters, in particular the concentration of cortisol, adrenaline, glucose, lactic acid, etc. Such markers allow us to detect physiological signs of stress even before clinical manifestations appear. Equally important are ethological approaches that study the behavioral reactions of animals in response to their living conditions, interaction with people, and the presence of discomfort or aggression. This ensures a comprehensive assessment of welfare, both physical and psycho-emotional. Studies of the endocrine system are also important, as they allow us to monitor chronic stress on the body. In particular, measuring the level of stress hormones has become an important tool for determining the impact of exogenous factors or transportation conditions on the condition of animals. As a result, animal welfare is seen as an important element of bioethics, which is closely related to biosafety and human health in the context of the One Health concept.

Keywords: *animal welfare, biomarkers, stress hormones, ethology, veterinary medicine, animal protection*.

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БЛАГОПОЛУЧЧЯ ТВАРИН В КОНТЕКСТІ БІОЕТИЧНИХ ПРИНЦИПІВ І БІОБЕЗПЕКИ

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Анотація. У статті розглянуто сучасні підходи до розуміння благополуччя тварин як міждисциплінарного явища, що охоплює фізіологічні, поведінкові та етичні аспекти взаємодії людини з тваринами. Зазначено, що благополуччя тварин набуло широкого визнання як окрема наукова дисципліна, а його значення виходить далеко за межі ветеринарної медицини – охоплюючи екологічні, соціальні й біоетичні виміри. У статті розглянуто міжнародні правові підходи до регулювання сфери благополуччя тварин, зокрема акцент зроблено на європейські моделі, де захист тварин часто інтегровано в базові законодавчі акти. Окрему увагу приділено ролі освіти в формуванні гуманного ставлення до тварин: розкрито потенціал освітніх програм і курсів щодо благополуччя тварин, а також вплив змісту та підходів до навчання на формування цінностей у майбутніх фахівців. Наголошено на необхідності розвитку наукових досліджень, спрямованих на створення об'єктивних, науково обґрунтованих методик оцінювання стану тварин. Перспективними напрямами у дослідженні благополуччя тварин є методики, що спираються на аналіз біохімічних показників, зокрема концентрації кортизолу, адреналіну, глюкози, молочної кислоти тощо. Такі маркери дозволяють виявляти фізіологічні ознаки стресу ще до появи клінічних проявів. Не менш важливими є етологічні підходи, які досліджують поведінкові реакції тварин у відповідь на умови утримання, взаємодію з людьми, а також наявність проявів дискомфорту чи агресії. Завдяки цьому забезпечується всебічна оцінка добробуту – як фізичного, так і психоемоційного. Значущими також є дослідження ендокринної системи, які дають змогу відстежувати хронічні навантаження на організм. Зокрема, вимірювання рівня гормонів стресу, стало важливим інструментом для визначення впливу екзогенних чинників чи умов транспортування на стан тварин. У підсумку, благополуччя тварин розглядається як важливий елемент біоетики, що тісно пов'язаний із біобезпекою та здоров'ям людини в контексті концепції «Єдине здоров'я» (One Health).

Ключові слова: *добробут тварин, біомаркери, гормони стресу, етологія, ветеринарна медицина, зоозахист.*

Introduction. Animal welfare is defined as their physical and mental state, which depends on their living conditions (OIE, 2021). An animal is considered to be in a state of well-being if it is in good health, has comfortable living conditions, is adequately fed, and is protected from dangers. Although there is no universal definition of this concept, welfare is generally understood as the ability of an animal to adapt to environmental challenges and its response to them (Broom, 2007). Despite the close connection between the concepts of welfare and ethics, they are not identical. Ethics refers to society's moral beliefs about the proper treatment of animals (Grigg & Kogan, 2019). Animal welfare is a multifaceted phenomenon that reflects the physical, mental, and natural state of an animal at a given time. It helps to assess the extent to which an animal is able to cope with environmental conditions, whether its basic needs are met, and what possible consequences this will have on its health and behavior in the future.

The leading EU regulations define the concept of animal welfare in accordance with the approach proposed by the World Organization for Animal Health in 2008.

Ensuring animal welfare involves disease prevention, veterinary care, creating appropriate living conditions, providing quality food, humane treatment and an ethical approach to slaughter (Smulders & Algers, 2009; Yatsenko & Bulavina, 2020).

From the theoretical point of view, animal welfare is considered as their subjective state, which can range from severe suffering to complete comfort. There are many definitions of this concept, covering a wide range of factors – from physical injuries, diseases, physiological and behavioral disorders to psychological discomfort, negative experiences and positive emotions (Koziy, 2012). Since in real life conditions animals can experience both positive and negative impacts at the same time, the level of their welfare should be assessed as a balance between these two aspects (Dawkins, 2017).

Today, there are four main approaches to defining animal welfare, each of which is directly related to animal bioethics (Nedosiekov et al., 2021).

1. The ethical approach emphasizes the need to provide conditions that allow animals to live in accordance with their nature and exercise natural behavior. This is closely related to bioethics, as it defines the moral obligations of humans to animals, including respect for their natural needs.

2. The veterinary approach, which is based on the concept of the five freedoms, directly addresses both animal welfare and bioethical principles that provide for humane treatment, prevention of suffering and ensuring proper conditions for animal health.

3. The legal approach, which considers animals as subjects of law, is the legal embodiment of bioethical norms and aims to enshrine human responsibility for animal welfare at the legislative level**.**

4. The psychological approach, which considers well-being as a combination of the physical and emotional state of animals, is also reflected in bioethics, as humane treatment of animals involves not only the absence of physical suffering but also the provision of psychological comfort**.**

Thus, animal bioethics is a conceptual framework that integrates all these approaches, forming a comprehensive approach to ensuring animal welfare. It covers the responsible treatment of animals in agriculture, research, medicine, breeding, and keeping in conditions that minimize suffering and ensure proper living conditions (Rioja-Lang et al., 2020). Animal bioethics is closely related to animal welfare, as it sets moral boundaries for the acceptable treatment of animals, emphasizing the need to reduce pain, fear and stress, and to ensure that their natural needs are met. At the same time, bioethics is related to biosafety, as proper treatment of animals, humane conditions and stress reduction help reduce the risk of spreading zoonotic diseases, epidemics and biological threats that can have negative consequences for both animals and humans (Toschi Maciel & Bock, 2013). Thus, animal bioethics, welfare and biosafety form a single set of principles aimed at creating a balanced and safe system of interaction between humans and animals.

Purpose of the work. To analyze the concept of animal welfare in the context of bioethical principles and biosafety, to determine the relationship between these categories and to justify their role in ensuring humane treatment of animals and preventing biological threats. The article discusses the main approaches to the interpretation of animal welfare, their relationship with bioethics and their impact on biosafety. Particular attention is paid to the analysis of modern approaches to the regulation of animal welfare, as well as to the practical aspects of the implementation of bioethical norms and biosafety measures in various areas of human-animal interaction.

Research results and discussion. Today, the OIE's animal welfare guidelines are based on the Five Freedoms concept:

- Freedom from hunger and thirst – animals should receive a balanced diet and have constant access to clean water.
- Freedom from discomfort – providing comfortable conditions of detention, including a comfortable place to rest and the possibility of walking.

- Freedom from pain, injury, and disease – regular veterinary care, including vaccinations, deworming, vitaminization, and periodic medical examinations.
- reedom from fear and stress – creating conditions that minimize animal suffering, as fear and stress can cause aggressive behavior or injuries to both animals and others.
- Freedom of natural behavior – providing sufficient space and necessary objects (e.g., toys or exercise equipment) to allow animals to display natural behavioral characteristics.

Broom (2005) noted that the first three freedoms are mainly concerned with preserving the physiological state and integrity of the animal's body, while the last two freedoms are more related to ensuring the quality of life.

Over time, scientific research and practical observations in the field of animal welfare have led to the addition of the Five Freedoms concept (Brambell's provisions). A set of 12 criteria for assessing animal welfare was developed that focuses on the animals themselves and aims to analyze their experience in their own environment.

Animals have always had a certain level of well-being, but people's perceptions of it have changed over time. Important and effective strategies, especially for animals living in stable social groups, are to support and help others rather than to cause harm. This has contributed to the formation of certain moral systems in both animals and humans, as reflected in the research of Professor Broome (Broom, 2005).

One of the important ethical issues is that NGOs have drawn attention to the moral aspects of slaughtering animals for food, clothing, research, or as unnecessary objects (Eurobarometer, 2016; Fraser et al., 2013). In real life, moral issues of animal welfare arise in connection with what happens before an animal dies. In particular, this concerns the attitude of people to the animal in the last period of its life, especially before slaughter, as well as the methods of killing it. In most European universities, veterinary and zootechnical courses on animal welfare pay special attention to animal welfare issues.

A scientific approach to animal welfare is important because it requires interdisciplinary cooperation between researchers from different fields. These include agricultural engineering, animal husbandry, biology, physiology, veterinary medicine, ethology, animal psychology, and bioethics (Bessei, 2018; Hewson et al., 2005; Toates et al., 1991).

The analysis (Eurobarometer, 2016) showed that the majority of EU respondents view animal welfare as “a duty to respect all animals” (46%) or “caring for farm animals and improving their conditions” (40%). An overwhelming majority (94%) believe it is important to protect the welfare of productive animals. 89% Support the adoption of a law requiring all those who use animals for commercial purposes to provide them with proper care. Almost half (49%) believe that this law should be adopted jointly by the EU and national governments, while only 19% support its adoption by the EU alone.

The majority of Europeans (59%) are willing to pay more for products produced with animal welfare in mind: 35% of them agree to a price increase of up to 5%, while only 3% are willing to pay more than 20%. At the same time, 35% are not ready for additional costs. More than half of EU citizens (52%) pay attention to animal welfare labeling when buying food. In addition, 47% of respondents believe that the selection of such products in stores is insufficient, which is 9% more than in the 2006 Eurobarometer. Thus, these data emphasize the importance of discussing our attitude towards animals and animal products through the prism of their welfare.

Animal welfare as a scientific discipline studies the condition of animals and their ability to adapt to environmental conditions. When life conditions change, the animal body uses various mechanisms to maintain homeostasis. On the one hand, sympathoadrenal regulatory mechanisms are activated, which help mobilize energy resources and reduce energy consumption for routine processes. On the other hand, adaptation can occur through ethological mechanisms – behavioral reactions aimed at reducing pain or fear. Biochemical changes in the body and behavioral features serve as objective indicators of animal welfare (Prykhodchenko et al., 2024).

The degree of adaptation of an animal can be assessed both qualitatively and quantitatively at any given time. A qualitative assessment of welfare is defined as good (if homeostatic indicators

are in line with physiological norms) or poor. The assessment of well-being should be based on a scientific approach, without the influence of moral and ethical factors. The term "welfare" refers only to the condition of a particular animal, not to human attitudes toward it. At the same time, subjectivity in this matter remains due to the limited assessment methodology.

Animal welfare can be seen as a balance between the satisfaction of its needs and health. Only experts – ethologists, animal breeders and veterinarians – can provide an objective assessment. From a practical point of view, it is important to determine the minimum acceptable level of welfare. However, no objective criteria for this threshold have been established yet, so decisions on thresholds are often based on the knowledge and moral and ethical views of experts. When assessing animal welfare, the most objective information can be obtained by analyzing their behavior and physiology. Animals have effective adaptation mechanisms, but if they fail to restore homeostasis, their condition is considered unsatisfactory. Deviations in homeostatic parameters serve as indicators of well-being (Ferrante et al., 2015).

Pain is one of the main indicators of discomfort, but there are currently no accurate methods for quantifying its level in animals. It is also not well understood whether animals can anticipate death and experience fear of it. If they are not aware of it, their condition remains stable until the last moment. However, neglecting their welfare before slaughter causes significant stress and suffering. Thus, animal welfare is a condition determined by the level of satisfaction of their needs and the absence of discomfort (Chmelíková et al., 2020).

The methods used by scientists to assess the level of animal welfare take into account both external and internal indicators of their condition. In addition, animal welfare is related to their subjective feelings and covers morphological, physiological, behavioral and mental aspects (Broom & Fraser, 2007).

Five main categories are proposed for assessing animal welfare: health, productivity, morphological, physiological and behavioral parameters.

Health is a key indicator of welfare, as it is directly related to the physical and psychological state of animals. Despite the fact that health is interrelated with other criteria, it is distinguished into a separate category due to its significant impact on the general condition of the animal. Determining the level of well-being involves identifying diseases, assessing their course, and predicting their consequences. The duration of suffering depends on the nature of the disease, treatment methods and veterinary care. Direct and indirect indicators, such as changes in feed and water consumption, can serve as early warning signs (Bessei & Kjaer, 2015). The key criteria for health assessment are stress level and mortality of animals.

Stress is one of the most common manifestations of poor animal welfare, which is reflected in their behavior. An objective assessment of stress can be obtained through blood tests, measuring glucose, catecholamines, cortisol, and changes in the leukocyte count. A decrease in glucose, an increase in cortisol and catecholamines, and an increase in granulocytes indicate a stressful state and require further study (Markovszky et al., 2020; Mahboub et al., 2004).

Animal mortality is often the result of severe stress caused by production conditions. For example, high broiler density leads to their deaths, and losses can reach 10% during transportation of pigs to the slaughterhouse. In dairy calves, mortality rates reach 30% (Broom, 2000), indicating a critically low level of welfare.

In animal husbandry, productivity (egg, meat, wool production), feed consumption, feed conversion, morbidity and mortality are key indicators. High egg production in chickens indicates normal reproductive tract function and the absence of stressors that reduce it (heat stress, overcrowding, social conflicts). Similar patterns are observed in broilers in terms of growth and feed conversion. Short-term stress may not affect productivity, but long-term stress has negative consequences. At the same time, reduced productivity does not always mean low welfare. For example, low-protein diets or reduced daylight hours can reduce productivity without compromising health. On the contrary, reducing the growth rate of broilers can even improve their condition by reducing leg problems (Botreau et al., 2007). Thus, in productive animals, the level of welfare directly affects product quality, and its deterioration leads to a decrease in product

quality. The above facts show that the assessment of animal welfare requires in-depth analysis and expert experience.

Various morphological changes can indicate a deterioration in animal welfare. For example, limb lesions in poultry, cannibalism and pecking are direct indicators of the health status and housing conditions of layers and broilers (Cronin et al., 2012; Baxter, 1994). Bone fragility in laying hens increases the risk of fractures. In cage housing systems, lack of physical activity reduces bone strength, leading to fractures, especially of the humerus, during mishandling (Fleming et al., 2006; Hartcher & Jones, 2017). In alternative systems, bone strength is higher, but fractures still occur when moving to the perch or nest (Bessei, 2018).

Under normal conditions of homeostasis, the body adapts to the environment. However, prolonged exposure to stress leads to elevated levels of corticosterone, which indicates a disruption of adaptation and is an indicator of decreased well-being (Bessei, 2006).

Given the similarities between the anatomical and physiological systems of animals and humans, it is recognized that "higher" animals are capable of experiencing emotions. The most acute suffering is caused by the failure to meet their basic needs for water, food, space, or social interaction. Many animal welfare problems arise from ignoring their ethological characteristics, such as the lack of dust baths and perches for chickens, eye contact between calves, or social bonding for pigs. Such conditions cause stress and discomfort, which negatively affects their condition (Bashchenko et al., 2017).

Thus, animal welfare is determined by the level of their health, productivity, physiological and behavioral characteristics. Its assessment is based on certain measurable indicators that can be determined using modern methods and tests. At the same time, according to scientists (Whiting, 2011), people are able to intuitively recognize the state of well-being or unhealthiness of animals by simply observing.

Determination of the negative state of animal welfare is more objective and studied in detail, as its signs are easier to detect than manifestations of positive emotions. Tests for frustration, fear, and contact avoidance have proven to be particularly effective in the study of low welfare (Nedosekov et al., 2021).

Assessing positive animal welfare is a complex task, as it depends on the needs of animals and often reflects their level of motivation (Harley & Clark, 2019; Duncan et al., 2019). Despite scientific advances in this area, all tests should be used with caution, as their results may vary depending on the conditions of detention and characteristics of different groups of animals.

The animal welfare assessment system is constantly improving and requires further research to improve its accuracy and objectivity. Since welfare is determined by the interaction of morphological, physiological, behavioral and psychological factors, an important area of research is the development of new assessment methods. In particular, the use of modern technologies, such as tomography to analyze morphological and physiological aspects and study psychosomatic reactions of animals, will help to create effective criteria for assessing their welfare.

One of the most controversial aspects of animal welfare research is the attempt to present it in the form of a quantitative assessment that allows to classify the animal's condition into one of two categories: high (good) or low (unsatisfactory) level of welfare (Broom, 2006).

Despite the availability of a large number of clinical, physiological, and biochemical indicators, not all of them are suitable for a comprehensive assessment of the animal's general condition. Therefore, specialists need to have a set of indicators that reflect both positive and negative aspects of well-being, which can be presented in numerical form with subsequent ranking. It should be emphasized that while signs of poor health are usually easy to detect, a high level of well-being often does not have pronounced, obvious manifestations. Thus, when assessing the level of welfare of an individual animal, one should take into account not only the current condition, but also the possible short-term and long-term consequences of this condition for its health and general well-being.

Poor animal welfare occurs when an animal is unable to adapt to the effects of a negative factor, remaining at the stage of stress exhaustion. This is manifested externally through behavioral

disorders, reproductive disorders, reduced growth of young animals, and in males, loss of sexual activity and memory impairment. Internal signs are changes in blood composition. Both types of manifestations can be both short-term and long-term. Despite the fact that the assessment of the psychological state of animals in different environmental conditions is important, its practical application in livestock production remains difficult and does not always allow for a clear link between the results and the actual level of well-being (Moesta et al., 2008; Nedosekov et al., 2020). In this context, behavioral indicators act as a realistic tool for assessing the mental state of animals. In particular, Bessei (2018) proposed a system for assessing the behavior of poultry, based on a scale from general suffering to complete well-being.

Physiological and biochemical signs of low well-being are manifested by both activation of some processes (e.g., brain activity, respiration, blood circulation) and inhibition of others (digestion, urination). Broom (2007) emphasizes the importance of accurate determination of basic physiological parameters, which is complicated by direct contact with the animal. Therefore, it is advisable to use only remote monitoring methods.

The animal's condition can be assessed by a simple method – counting the respiratory rate, which reflects the activity of the sympathoadrenal system and the increase in oxygen demand. Respiratory rate is also related to heart rate and can be recorded remotely – in real time or via video. You can also notice muscle tremors from a distance, which occurs when you are very frightened. External signs of stress include frequent urination, defecation, excessive salivation, and foaming at the mouth (Amat et al., 2016; Nagaraja et al., 2016). Nausea, vomiting, and diarrhea that occur in response to negative environmental factors can be signs of reduced welfare in animals. The cardiovascular system usually shows tachycardia, although sometimes the opposite reaction is possible – a slowing of the heart rate (bradycardia). The level of hunger in an animal can be assessed by a number of blood parameters, including glucose, β-oxybutyrate, and plasma proteins (Yan et al., 2014; Rom & Reznick, 2016).

One of the most important indicators of animal well-being or welfare during transportation is the sympathoadrenal system response. The adrenal glands have two main parts – cortical and cerebral, each of which performs separate functions and produces different hormones.

The medulla synthesizes catecholamines – adrenaline and noradrenaline, which are activated during stress. The cortical layer produces glucocorticoids (cortisol, corticosterone), which increase blood glucose levels and suppress inflammatory processes, as well as mineralocorticoids (aldosterone), which regulate water-salt balance by retaining sodium and excreting potassium. Unlike glucocorticoids, mineralocorticoids can enhance inflammatory reactions.

To assess the stress state, especially in large ungulates, the level of cortisol in saliva is often analyzed, since it is the free form of this hormone that is biologically active and easily penetrates saliva through cell membranes. The content of cortisol in saliva correlates well with the level of its free form in blood plasma (Broom, 2007; Brennan et al., 2016).

Cortisol levels in saliva are about ten times lower than in blood, but changes in adrenal activity are still clearly reflected in its concentration in saliva. That is why this indicator is widely used to assess the stress response of the sympathoadrenal system in various species of animals – cattle, pigs, sheep, and humans. It should be borne in mind that the increase in salivary cortisol levels occurs with a delay of several minutes compared to the increase in blood cortisol concentration. The reaction to stressful influences, in particular during manipulation or transportation, varies between species and even breeds of animals. For example, animals that have a more pronounced corticosteroid response often experience an increase in body temperature of about 1 ºC.

Parrott et al. (1999) used a remote method to measure body temperature in sheep during transportation. After 2,5 hours in transport, the temperature increased by 1 °C and remained elevated by another 0,5 °C for several hours after the transportation was completed. This was not due to active movement, as physical activity caused a 2 °C increase in temperature, but it quickly

returned to normal after stopping the activity. Thus, an increase in temperature during transportation may indicate a decrease in well-being.

Blood enzyme values can serve as indicators of low animal welfare. Broom (2000) notes that in case of injury or excessive physical activity, the activity of creatine kinase and lactate dehydrogenase enzymes increases in animals. An objective assessment of the condition is also provided by the biochemical triad: the level of corticosterone, glucose, and lactic acid in the blood plasma, as well as a general hematological analysis. For example, with short-term stress, the number of red blood cells increases (Parrott et al., 1998), while prolonged stress, on the contrary, leads to a decrease in their number, as confirmed by the following studies (Prykhodchenko et al., 2024).

Animal health is closely linked to human health, which is emphasized by the concept of One Health, which combines the welfare of animals, humans and the environment (Simonin et al., 2019; Rodionova et al., 2020). According to the WHO, more than 75% of new diseases that occur in humans are of zoonotic origin (WHO, 2011; Klestova, 2016). Viruses such as avian and swine flu pose serious risks to human health and the economy (Beach et al., 2007). Bacterial (*Campylobacter, Salmonella*) and parasitic (toxoplasmosis, cysticercosis) infections also pose a global threat (Zinsstag, 2007; Torgerson, 2011; Platts-Mills et al., 2014).

Improving animal welfare is closely linked to the control of zoonoses (Singer et al., 2007) and thus to human health. De Passillé and others believe that this link is a key argument in favor of a high priority for animal welfare certified products in the human diet (de Passillé et al., 2005; Dawkins, 2016).

Most European countries have animal welfare legislation in place. Some states, such as Switzerland (1992), Germany (2002), Luxembourg (2007), and Austria (2013), have included these norms in their supreme legislative documents. For example, the Constitution of Luxembourg explicitly states that the state shall promote the protection and welfare of animals (Falaise, 2019). At the same time, a comparison of laws shows significant differences in penalties for animal cruelty. In addition, some legally permitted practices (such as bullfighting, cockfighting) are still legalized under the pretext of cultural heritage. Other painful procedures are also allowed, such as the use of electronic collars, castration, and cutting of horns or beaks.

The legislative framework for animal welfare in Ukraine began to take shape with the adoption of the updated law on veterinary medicine. An important milestone was the adoption of Law of Ukraine № 3318 “On Veterinary Medicine and Animal Welfare” in 2021. This document was created to comprehensively regulate issues related to the protection of animal health, animal welfare, veterinary practice, and the production and use of veterinary drugs. The law takes into account Ukraine's international obligations, in particular the requirements of the Association Agreement with the EU (Yatsenko et al., 2020).

European universities are increasingly paying attention to training courses on the welfare of productive animals. For this purpose, various educational tools are actively used, including free online courses. Research in this area focuses on how and why animal welfare should be taught (Lord & Walker, 2009; Main, 2010; Abood et al., 2012), as this science is closely related to values (Fraser, 1995). The content and approach to teaching can have a significant impact on the further perception of the topic (Paul et al., 2000; Clark, 2010).

Despite its interdisciplinary nature (ethology, veterinary medicine, economics, biology), there are still not enough publications on the educational aspects of the topic (MacKay, 2020). It is worth remembering that the fundamentals of welfare, including health, have long been part of veterinary education (Broom, 2005). Public and international organizations expect veterinarians to become leaders in animal welfare, which emphasizes the importance of including the following courses in the curriculum.

Conclusions.

Animal welfare is an interdisciplinary category that combines physiological, behavioral, legal and ethical aspects and has gained the status of a separate scientific discipline with a significant impact on veterinary medicine, education, ecology and bioethics.

European countries demonstrate high standards of legislative regulation of animal protection, including constitutional provisions. In Ukraine, an important step in this direction was the adoption of the Law "On Veterinary Medicine and Animal Welfare" (2021), which facilitates the adaptation of national legislation to European standards.

Education is a key tool in fostering humane treatment of animals. The introduction of animal welfare courses and programs in veterinary schools contributes to the development of professional ethics and responsible animal handling.

Objective assessment of animal welfare requires the development of scientific research, in particular in the field of analyzing biomarkers of stress, behavioral reactions and hormonal levels, which allows us to accurately determine the level of animal welfare and timely identify threats to their health and safety.

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