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VETERINARY AND SANITARY ASPECTS AND TECHNOLOGIES FOR PROCESSING KERATIN AND COLLAGEN CONTAINING WASTE FORMED IN SLAUGHTER POINTS OF RURAL SETTLEMENTS (ON EXAMPLE OF HORSE - HOOVED)

Abstract

The article presents the results of a study on the analysis of rational processing technologies for keratin and collagen-containing meat processing wastes regarding the receipt of demanded products. It has been established that one of the effective ways of processing keratin and collagen-containing waste is to obtain protein feed additives based on various technological processes. The problems of utilization and processing of keratin and collagen-containing waste in existing slaughter shops located in rural areas, consisting in the absence of special facilities for storing and processing these wastes, are revealed. As a result, these wastes are disposed of in landfills without complying with veterinary and sanitary requirements and recommendations, which can lead to the propagation of harmful viruses for human and animal health. To solve this problem, a technological scheme has been developed for processing collagen and keratin-containing raw materials formed in such slaughterhouses with the development of specific veterinary and sanitary requirements and recommendations based on the example of horns and hooves. In laboratory conditions, according to the model of the developed technological scheme, scientific and experimental work was carried out to obtain a protein product by the method of hydrolysis of horns and hooves. As a result, experimental samples of a protein product and a liquid protein concentrate with high emulsifying ability were obtained. - the resulting feed additive contains at least 70% protein and 6% fat with 9% moisture. The product yield was 65-70% by weight of fresh horned hoofed raw materials.

Keywords: *keratin, collagen, veterinary and sanitary aspects, slaughterhouse, hydrolysis, disulfide bonds, horns and hooves, protein product, emulsifying ability.*

Introduction. The problem of processing and rational use of meat wastes in recent years has become especially urgent. This is due to the fact that in the meat industry, several types of secondary raw materials and waste are obtained in the process of processing raw materials (blood, bone, by-products of category II, raw fat, horn-tortured raw materials, skin - raw materials, etc.).

The amount of secondary raw materials formed depends on the type of processed primary raw materials and makes up up to 56.6% of live weight, cattle - 82.4%, pigs - 39.7% during processing of cattle.

Keratin-containing raw materials (horns, hooves, hair, bristles, wool) make up a relatively small part of the total amount of non-food waste generated [1-3]. However, taking into account the growing number of processed livestock at large, medium and small meat processing and slaughter centers existing in all regions of the Republic of Kazakhstan, this is a significant amount.

Analysis of the degree of processing in the context of the Republic of Kazakhstan showed that a significant part of keratin and collagen containing meat processing waste has not yet been used and is disposed of in landfills, which, in addition to material losses, leads to environmental pollution.

It should be noted that this problem is especially acute in rural districts, towns and district centers, where the issues of disposal of waste generated during the slaughter of farm animals are not completely resolved.

Thus, unprocessed keratin and collagen-containing wastes have the ability to sorb microorganism cells and can become a source of the formation of various viruses and worsen living conditions and the health of the population and animals in general.

Therefore, the problem of processing and rational use of waste generated during the slaughter of farm animals in slaughterhouses existing in rural districts, towns and district centers of the Republic of Kazakhstan and the creation of specific veterinary and sanitary measures for their successful implementation in practice in recent years has become especially urgent.

One of the promising areas for the processing of waste generated during the slaughter of farm animals in slaughterhouses existing in rural districts, towns and regional centers of the Republic of Kazakhstan is the development of mobile technology for the creation of protein feed and bone meal based on horn-hoofed raw materials.

The main idea is to create small enterprises in the regional centers of the Republic of Kazakhstan for the processing of keratin and collagen containing waste generated in slaughterhouses with the development of veterinary and sanitary requirements and recommendations taking into account specific local conditions.

Domestic and foreign experience in the processing of keratin-containing raw materials - waste from poultry and meat processing, fur, leather and wool processing enterprises (feather, down, hair, horns, hooves, bristles, lobash, wool flaps) for feed purposes showed that the use of farm animals in diets feed containing keratin, positively affects the increase in their mass, reduces feed costs and contributes to a high yield of edible slaughter products. The use of well-known protein feed additives from keratin-containing raw materials (horned ungulates, feathers, meat and bone meal, etc.) indicates that it is a valuable initial product for the production of dry animal feed [4-7].

Feed additives are introduced into diets from natural feed, as well as into compound feeds, protein and vitamin supplements, premixes. Animal feed is used mainly as protein feed additives.

Proteins are nitrogenous, high molecular weight organic compounds that are polymers of amino acids. Vegetable feed is a cheap source of protein, but inferior to animal feed in the content of essential amino acids.

The biological role of these amino acids is determined by the fact that they are part of all the most important proteins in animals, but are not synthesized in it and are not replaced by other amino acids.

Of the twenty amino acids that make up most proteins, ten (lysine, methionine, tryptophan, valine, leucine, isoleucine, phenylalanine, histidine, arginine, threonine) are indispensable in nutrition. The first three of them are critical (limiting, the most scarce in the composition of the diets), since they are the most lacking in cereal feeds.

Protein feed additives are characterized by a high protein content and its biological usefulness, they contain high-value protein in amino acid composition. Therefore, they are used in the manufacture of combined feeds to regulate the amino acid composition.

Keratins belong to the group of scleroproteins or structural proteins and represent the bulk of the substance of such natural products of animal origin as wool, hair, down, feather, horns, bristles and hooves. High sulfur content distinguishes keratin from proteins of other groups.

In pure keratin-containing raw materials with a moisture content of 10-15%, the protein content reaches 80-85%. This raw material is a natural protein concentrate with a favorable ratio of amino acids, including essential ones. In terms of the ratio of essential amino acids, keratin is similar to meat, in terms of lysine content it surpasses milk.

Keratins are proteins that are most resistant to chemical influences and cannot be used as a feed product without special treatment. This protein is practically unassimilable by animals and humans.

Keratin is characterized by limited solubility in water, salt solutions, alcohols and other organic solvents, high resistance to chemicals and enzyme preparations, fibrillar structure of molecules and mechanoprotective functions.

Therefore, for the use of keratin-containing raw materials for food purposes in a protein molecule, it is necessary to destroy disulfide bonds, which leads to an increase in the reactivity of keratin. As a result, water-soluble polypeptides are formed, which in the animal's body are easily exposed to digestive enzymes. One of the ways to achieve this goal is the hydrolysis of raw materials, which is understood as the decomposition of substances that takes place with the obligatory participation of water. The products of hydrolytic cleavage of proteins are hydrolysates. During protein hydrolysis, the breakdown of long polypeptide chains up to individual amino acids occurs.

Protein hydrolysates from keratin-containing raw materials are widely used both in our country and abroad.

The information obtained from the literature indicates the use of these hydrolysates for various purposes: in feed production, in cosmetics, in medicine, in the food industry, for the production of

glue, plastics and artificial fiber, for the production of peptone, emulsions, fire-fighting mixtures, in foundry, etc. [8.9].

There are numerous studies related to the development of waste-free, highly efficient and energy-saving biotechnological processes for obtaining feed products from pulp, meat and bone raw materials, industrial blood, collagen-keratin-containing, raw materials, bone, etc.

However, in the practical implementation of these processes, a differentiated scientific approach is necessary for each specific situation, taking into account numerous factors: place of implementation, veterinary and sanitary conditions, feeding, age and types of breeds, climatic conditions, etc.

Therefore, the lack of data on a number of important veterinary and sanitary aspects of the problem associated with the disposal of unused collagen and keratin-containing wastes generated during the slaughter of farm animals in rural areas and obtaining a feed product on their basis is an urgent task.

At the same time, chemical and biological studies of the suitability and effectiveness of its use as a protein feed additive in the diets of farm animals and birds, the effect on their health, opens up the objective need for comprehensive scientific work in this direction.

Therefore, the goal of our work is:

- development of veterinary and sanitary requirements and recommendations for its implementation in small enterprises, taking into account specific rural local conditions.
- studies of the possibility of processing horn-hoofed raw materials of the West Kazakhstan region in the formation of farm animals during slaughter in rural areas in order to obtain protein feed additives;

As an object of research, a slaughterhouse of farm animals located on the territory of the Elysy market was selected. It should be noted that the horns and hooves of animals formed during slaughter in the specified slaughter center along with bone limbs are mainly sent to a landfill. Since there are no special premises near the slaughterhouse intended for temporary storage with subsequent disposal of the resulting keratin and collagen containing wastes in compliance with all veterinary and sanitary requirements.

Similar situations are repeated in other slaughter centers of the city and rural settlements. Given the above local specific conditions in slaughterhouses, we have created an approximate technological scheme for processing collagen and keratin-containing raw materials formed in such slaughterhouses with the development of specific veterinary and sanitary requirements and recommendations. The technological scheme of processing horns and hooves formed in slaughterhouses with obtaining protein feed additives (figure 2)

According to the proposed technological scheme, it is possible to organize mini workshops for processing horns and hooves in each rural locality or in the regional center, strictly observing the recommended veterinary and sanitary requirements. For its practical implementation does not require expensive equipment and a large building. The weight of the technological cycle can be placed in one small building with a collapsible design. As a result, utilization of keratin-containing horns and hooves is achieved with the receipt of a popular protein feed additive for use in the diets of farm animals and birds.

Research materials and methods. To obtain protein concentrate based on the processing of horns and hooves, we, together with scientists from the Faculty of Engineering, designed and manufactured a special reactor for their hydrolysis in order to obtain experimental laboratory samples (figure 1).



Figure 1 - General view of the reactor for the hydrolysis of horns and hooves

The reactor is a round-shaped metal vessel made of stainless steel, hermetically sealed with a lid. The reactor is equipped externally with electrotenes for heating and is insulated from the external environment. The heating temperature reaches up to about 135-150 °C.

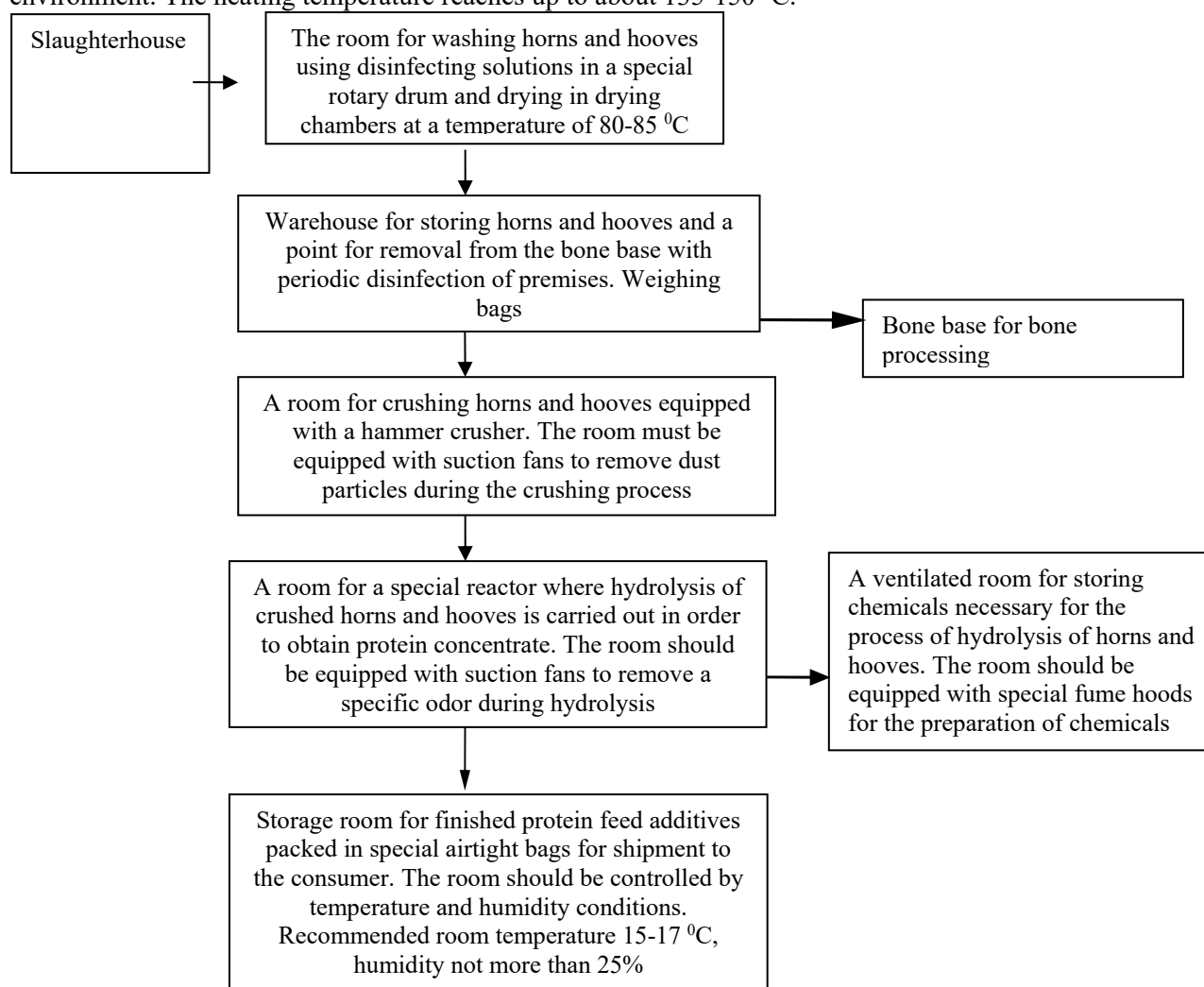
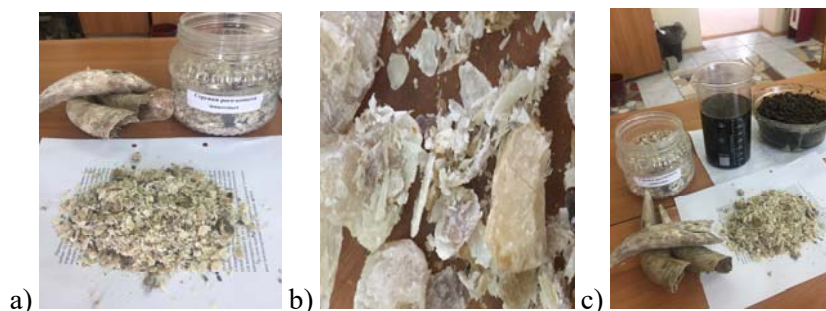


Figure 1 - Technological scheme for processing horns and hooves formed in slaughterhouses with obtaining protein feed additives.

For scientific and experimental work, the horns and hooves of cattle from the slaughterhouse located on the territory of the El Yrysi market were used as main raw materials

To carry out the process of hydrolysis of the horns and hooves from the slaughterhouse, they were delivered to the laboratory of the Educational and Scientific-Production Center of the Engineering Faculty in compliance with the recommended veterinary and sanitary requirements. First, the horns and hooves were separated from the bone base and thoroughly washed with running water using a disinfectant solution. After washing, the horns and hooves were dried in a ShSP-0.5–70 drying oven at a temperature of 80 ° C for 1.5–2 hours. After drying, the horns and hooves were crushed using a hammer mill. After crushing, the horns and hooves turn into shavings representing polydisperse particles with sizes of 0.2-1.5 cm (figure 3).



a) total horns after crushing; b) shavings of crushed horns under a microscope, magnification x50; c) a general view of the obtained hydrolyzate separated from the liquid part from the solid particle

Figure 3 - Horns and hooves after crushing and hydrolysis process

After crushing, the horns and hooves were dosed using an electronic balance and poured into the reactor with the addition of water in the ratios of 1: 10 and 0.25% ammonia solution (NH₄OH) to carry out the hydrolysis process. The purpose of hydrolysis is to destroy the compact structure of the keratin molecule to produce polypeptides, peptides and individual amino acids.

An ammonia solution (NH₄OH) was used to break the disulfate bonds of keratin-containing raw materials. The hydrolysis process was carried out at a temperature of 110-135 ° C for 4 hours. The pressure inside the reactor was 0.2 MPa.

After the completion of the hydrolysis process, the reactor was cooled off. After cooling to a temperature of 35-40 ° C, the hydrolyzate was poured through a drain valve located on the bottom of the reactor. After hydrolysis, a thick dark liquid and softened particles of horns and hooves of yellow color are obtained. The liquid part from the solid was separated by pouring a thick liquid through a sieve with a diameter of 1.5 mm. The fresh solid part of the hydrolyzate is a soft yellow substrate and visually resembles overcooked meat with a specific smell (figure 4).



a) the process of separating the liquid part from the solid through a sieve; b) the solid part of the hydrolyzate; c) the solid part of the hydrolyzate under a microscope, x50 magnification

Figure 4 - General view of the solid parts of the hydrolyzate

After cooling, the dried product was crushed on a porcelain mortar into particles of less than 3 mm. The result is a feed additive that contains at least 70% protein and 6% fat with 9% moisture. The product yield was 52-55% by weight of fresh horned hoofed raw materials.

Conclusions:

- Analyzed rational processing technologies for keratin and collagen-containing waste meat processing regarding the receipt of popular products;
- it was found that one of the effective ways of processing keratin and collagen-containing waste is to obtain protein feed additives based on various technological processes;
- The problems of utilization and processing of keratin and collagen-containing waste in existing slaughterhouses located in rural areas, consisting in the absence of special facilities for storing and processing these wastes, were identified. As a result, these wastes are disposed of in landfills without complying with veterinary and sanitary requirements and recommendations, which can lead to the propagation of harmful viruses for human and animal health;
- to solve this problem, a technological scheme has been developed for processing collagen and keratin containing raw materials formed in such slaughterhouses with the development of specific veterinary and sanitary requirements and recommendations for example, horns and hooves;
- in laboratory conditions, according to the model of the developed technological scheme, scientific and experimental work was carried out to obtain a protein product by the method of hydrolysis of horns and hooves. As a result, experimental samples of a protein product and a liquid protein concentrate with high emulsifying ability were obtained.
- the resulting feed additive contains at least 70% protein and 6% fat at 9% moisture. The product yield was 65-75% by weight of fresh horned hoofed raw materials.

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ТҮЙІН

Мақалада кератин мен коллагені бар етті қайта өңделетін қалдықтарын өңдеудің ұтымды технологияларын сұранысқа ие өнімдерді алуға қатысты зерттеу нәтижелері келтірілген. Кератин мен коллагені бар қалдықтарды өңдеудің тиімді әдістерінің бірі әртүрлі технологиялық процестерге негізделген ақуыздық қоспалар алу болып табылады. Ауылдық жерлерде орналасқан мал соятын цехтарда кератин мен коллагені бар қалдықтарды кәдеге жарату және қайта өңдеу мәселелері, осы қалдықтарды сақтау мен өңдеудің арнайы қондырғылары жоқ. Нәтижесінде, бұл қалдықтар ветеринариялық-санитариялық талаптар мен ұсыныстарды сақтамай полигондарға шығарылады, бұл адам мен жануарлар денсаулығына зиянды вирустың таралуына әкелуі мүмкін. Бұл мәселені шешу үшін мүйіз бен тұяқтың мысалына сүйене отырып, арнайы ветеринариялық-санитариялық талаптарды және ұсыныстарды әзірлеп, осындай мал сою пункттерінде түзілетін коллаген мен кератині бар шикізатты өңдеудің технологиялық сызбасы жасалды. Зертханалық жағдайда, әзірленген

технологиялық схеманың үлгісіне сәйкес, мүйіздер мен тұяқтарды гидролиздеу әдісімен ақуыз өнімін алу үшін ғылыми және тәжірибелік жұмыстар жүргізілді. Нәтижесінде ақуыз өнімінің және жоғары эмульсиялық қабілеті бар сұйық ақуыз концентратының тәжірибелік үлгілері алынды. Алынған жем қоспасы құрамында кемінде 70% ақуыз және 9% ылғалдылықпен 6% май болады. Жаңа мүйізді тұяқты шикізаттың өнімі 65-70% құрады.

РЕЗЮМЕ

В статье представлены результаты исследования по анализу рациональных технологии переработки кератин и коллагеносодержащих отходов мясопереработки касательно получения востребованных продуктов. Установлено, что одним из эффективных путей переработки кератин и коллагеносодержащих отходов является получение белковых кормовых добавок на основе различных технологических процессов. Выявлены проблемы утилизации и переработки кератин и коллагеносодержащих отходов в существующих убойных цехах расположенных в сельских населенных пунктах, заключающиеся в отсутствии специальных помещений для хранения и переработки указанных отходов. В результате эти отходы вывозятся на свалки без соблюдения ветеринарно-санитарных требований и рекомендации, что могут привести размножению вредных вирусов для здоровья людей и животных. Для решения данной проблемы разработана технологическая схема переработки коллаген и кератинсодержащего сырья, образующихся в подобных убойных пунктах с разработкой конкретных ветеринарно-санитарных требований и рекомендаций на примере рогов и копыт. В лабораторных условиях по модели разработанной технологической схемы проведены научно-экспериментальные работы по получению белкового продукта по методу гидролиза рогов и копыт. В результате получены опытные образцы белкового продукта и жидкого белкового концентрата обладающего высокой эмульгирующей способностью. Полученная кормовая добавка содержит не менее 70% протеина и 6% жира при 9% влаги. Выход продукта составляло 65-70% от массы свежего рогокопытного сырья.

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STUDY OF THE BIOLOGICAL PROPERTIES OF THE NEWCASTLE DISEASE VIRUS STRAINS

Abstract

Newcastle disease is the most contagious and dangerous viral infection of domestic and wild birds.

Kazakhstan has a huge territory crossed by large overpasses, and hundreds of bird species are concentrated in natural landscapes during periods of migration and reproduction

The data obtained in many years of research indicate a poor situation in Kazakhstan due to Newcastle disease among domestic birds of both industrial and household content.

Circulation in populations of synanthropic birds epizotically topical, mesogenic strains the virus of Newcastle disease, which antigenetically differs from previously circulating variants, determines the need for regular monitoring of this pathogen to Kazakhstan

From the scientific data it should be emphasized that the most significant viral infection for the poultry industry of the Republic of Kazakhstan, Newcastle disease continues to be in sight, leading positions in terms of the degree of danger and economic losses. The analysis of the spread of these diseases in the Republic of Kazakhstan is characterized by the annual registration of new foci of diseases.