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PROBIOTICS ISOLATED FROM THE SHUBAT IN CHICKEN MEAT PRODUCTION: IMPORTANCE AND HACCP ANALYSIS

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Probiotics are becoming more widely acknowledged as a safe and effective alternative to antibiotics for improving the safety of chicken meat. The investigation of potential hazards throughout the chicken meat supply chain enables a thorough assessment of contamination risks, allowing for the establishment of control and corrective actions within the corresponding processes. The ultimate goal is to ensure the safety of chicken meat for consumers. The objective of this study is to ascertain the potential risks that may arise inside the chicken production process, encompassing physical, chemical, and biological factors, with the identification of critical control points (CCPs). The study is also aiming to identify corrective strategies and approaches for decreasing the hazards associated with using of probiotics obtained from shubat. The research conducted involved conducting microbiological evaluations to test the ability of probiotics to withstand the presence of pathogenic bacteria. Additionally, the study examined the use of probiotics in chicken production, employing careful monitoring and comprehensive analyses to figure out the effectiveness of the supplements. For hazard identification and risk assessment, the Hazard Analysis and Critical Control Points (HACCP) approach was used, with the key findings showing that the most critical activities throughout the entire chain pertained to the use of probiotics as an alternative to antibiotics.

Keywords: chicken meat, safety, probiotics, HACCP, antibiotics.

ПРОБИОТИКИ ИЗ ШУБАТА В ПРОИЗВОДСТВЕ КУРИНОГО МЯСА: ВАЖНОСТЬ И АНАЛИЗ НАССР

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Пробиотики все шире признаются как безопасная и эффективная альтернатива антибиотикам для повышения безопасности куриного мяса. Исследование потенциальных опасностей вдоль цепочки поставок куриного мяса позволяет провести всестороннюю оценку рисков контаминации и создать меры управления и корректировки в соответствующих процессах. Конечной целью является обеспечение безопасности

куриного мяса для потребителей. Целью данного исследования является выявление потенциальных рисков, которые могут возникнуть в процессе производства куриного мяса, включая физические, химические и биологические факторы, а также выявление критических контрольных точек (ККТ). Исследование также направлено на выявление корректирующих стратегий и подходов для снижения рисков, связанных с использованием пробиотиков, полученных из шубата. В рамках исследования проводились микробиологические анализы для оценки устойчивости пробиотиков к патогенным бактериям, а также исследовалось их использование в производстве куриного мяса. В процессе исследования осуществлялись наблюдения и подробный анализ, необходимые для оценки эффективности пробиотиков. Для выявления опасностей и оценки рисков использовался метод анализа опасных факторов и критических контрольных точек (HACCP), с ключевыми результатами, показывающими, что наиболее критическими операциями во всей цепочке было использование пробиотиков как альтернативы антибиотикам.

Ключевые слова: куриное мясо, безопасность, пробиотики, ХАССП, антибиотики.

ТАУЫҚ ЕТІ ӨНДІРІСІНДЕГІ ШҰБАТТАН АЛЫНҒАН ПРОБИОТИКТЕР: МАҢЫЗДЫЛЫҒЫ ЖӘНЕ НАССР ТАЛДАУ

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Пробиотиктер тауық етінің қауіпсіздігін жақсарту үшін антибиотиктерге қауіпсіз және тиімді балама ретінде көбірек танылуда. Тауық етін жеткізу тізбегіндегі ықтимал қауіптерді зерттеу ластану қаупін жан-жақты бағалауға және тиісті процестерде бақылау мен түзетулерді орнатуға мүмкіндік береді. Түпкі мақсат – тұтынушылар үшін тауық етінің қауіпсіздігін қамтамасыз ету. Бұл зерттеудің мақсаты тауық етін өндіру процесінде туындауы мүмкін ықтимал қауіптерді, соның ішінде физикалық, химиялық және биологиялық факторларды анықтау, сондай-ақ сыни бақылау нүктелерін (СБН) анықтау болып табылады. Зерттеу сонымен қатар шұбаттан алынған пробиотиктерді қолданумен байланысты тәуекелдерді азайту үшін түзету стратегиялары мен тәсілдерін анықтауға бағытталған. Зерттеуде пробиотиктердің патогендік бактерияларға төзімділігін бағалау үшін микробиологиялық сынақтар жүргізілді, сонымен қатар олардың тауық етін өндіруде қолданылуы зерттелді. Зерттеу барысында пробиотиктердің тиімділігін бағалау үшін бақылаулар мен егжей-тегжейлі талдаулар жүргізілді. Қауіптерді анықтау және тәуекелдерді бағалау үшін қауіпті талдау және маңызды бақылау нүктелері (HACCP) пайдаланылды, негізгі нәтижелер бүкіл тізбектегі ең маңызды операциялар антибиотиктерге балама ретінде пробиотиктерді пайдалану екенін көрсетті.

Негізгі сөздер: тауық еті, қауіпсіздік, пробиотиктер, НАССР, антибиотиктер.

Introduction

Over the last 50 years, worldwide chicken production has expanded quickly, and poultry meat is currently the world's most consumed meat species [1]. The expansion of chicken meat production is accompanied by an increase in the risks posed to food safety [2].

Chicken meat is subjected to a variety of risks, including biological, chemical, and physical hazards that may be present in the meal and cause harm to the consumer's health if consumed. In terms of biological hazards, depending on their pathogenicity and the number and concentration of bacteria in the product, these microorganisms might be pathogenic and cause foodborne infections [3].

The goal of this project is to identify and analyze hazards and CCPs in each level of the poultry chain. Furthermore, the corrective and risk control methods applicable to the processes are defined based on the results.

Probiotics or directly fed microbials, prebiotics, phytobiotics, chemobiotics, symbiotics, and other alternatives to antibiotics are examples. Probiotics are live microbial feed supplements that may benefit the host animal after ingestion by boosting its gut microbial balance. Furthermore, probiotic organisms should be non-toxic,

nonpathogenic, and capable of tolerating bile salts and low pH in the gastrointestinal tract to increase their chances of survival in such an environment [4].

The key objectives of this study are to highlight the need of introducing probiotic applications in the poultry area and to illustrate the importance of completing complete safety assessments for the chicken meat production chain.

The hypothesis of the present investigation suggests that the use of probiotics in the production of chicken meat, as an alternative to antibiotics, will successfully limit the risks associated with contamination. Consequently, this intervention is expected to enhance the overall safety of chicken meat throughout the whole production process.

The significance of this study is due to its great value for the safety of chicken meat production. It does this by examining the potential of probiotics as a viable alternative to antibiotics and by implementing risk management methods through HACCP analysis.

Materials and research methods

Probiotics Source

Probiotics composition contents *L. paracasei* SH1, *E. faecalis* SH6 were used in this study as the potential probiotic microorganisms isolated from fermented camel milk (shubat) and *K. unispora* Y 2.2 isolated from fermented mare milk (koumiss) were selected based on their documented safety and potential benefits for chicken meat safety.

Microbiological Analysis

Microbiological evaluations involved culturing selected probiotic strains in suitable media, inoculating them with pathogenic bacteria, and assessing their viability in the presence of pathogens (*Salmonella, Listeria monocytogenes, E.coli, Campylobacter*) through colony-forming unit (CFU) counts.

Chicken Production and Probiotic Application

Chickens used in this study were reared under controlled conditions to minimize external variables. Details of the rearing conditions, including diet, housing, and biosecurity measures, were documented. Probiotics were administered to the chickens in accordance with recommended guidelines. The dosage, frequency, and method of application were standardized across experimental groups.

Identification of Hazards

The HACCP approach was systematically applied for hazard identification and risk assessment along the entire chicken meat supply chain, encompassing the identification and documentation of potential physical hazards in the chicken production process, evaluation of chemical hazards related to probiotic use, and assessment of biological hazards, including the presence of pathogenic bacteria in both the chicken environment and probiotic cultures. CCPs were identified based on the findings of hazard analysis. These points were determined as crucial for controlling and mitigating hazards related to the use of probiotics.

Literature review

The fundamentals of a food safety management system have been presented, and the major food safety risks related with broiler chicken production are now reviewed. A "biological, chemical, or physical agent in food, or condition of food, with the potential to cause adverse health effects" is defined as a food safety hazard [5]. Biological, chemical, and physical substances with the potential to induce adverse health effects are traditionally classified as food safety hazards [6].

Pathogenic bacteria such as *E. coli*, Salmonella, and Campylobacter, as well as molds, viruses, fungi, parasites, and algae, are examples of biological food safety concerns. Zoonoses are infections or diseases that can be passed from animals to people. Infection usually occurs as a result of ingesting animal products or coming into close touch with an infected animal. As a result, they can cross the species barrier between animals and humans [7].

Pesticides, biocides, and pest control chemicals such as rodenticides, cleaning chemicals, and wood treatment chemicals are all potential risks throughout the developing stage of poultry meat production. Wood shavings can be used as poultry bedding litter. Shields and colleagues looked at concerns about off-flavors in poultry meat fowl breeders also reported problems with fertility in their breeding flocks and vaccination ineffectiveness in fowl reared on wood shavings, which disappeared when raised on cereal straw [8].

Physical risks can appear at many stages of the food supply chain and, depending on the procedure, can be detected and/or removed during processing and food preparation. Physical food safety concerns include intrinsic hazards like fractured or splintered bone as well as extrinsic hazards like glass, metal, plastic, wood, or stones [9].

The objective of this research is to elucidate the application of HACCP in enhancing the microbiological safety and quality of broiler meat.

Results and their discussion

In Figure 1, the production process of chicken meat is visually depicted, providing an

overview of the entire process. Additionally, Table 1 offers a comprehensive breakdown of the hazards encountered at various stages within the slaughter process, along with the critical control points ascertained through the HACCP methodology. This data underscores the importance of implementing effective control measures to ensure the safety and quality of chicken meat production.

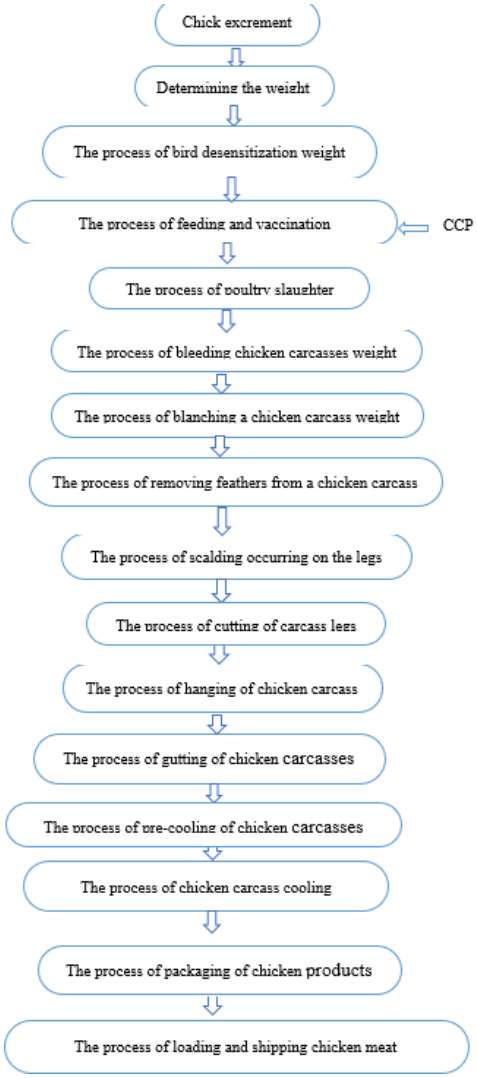

Figure 1. The technological process of making chicken meat.

The identified hazard analysis refers to potential problems that could arise during an operation. A stage in an operation may be connected with more than one hazard. Each hazard must be considered, and measures must be put in place to reduce or avoid its occurrence. Raw materials with a history of causing microbiological problems; contamination sites in the process; and the potential for microorganisms to survive or multiply during production, storage, distribution, or use are examples of potential hazards that could be identified in a meat or poultry plant.

After the hazards have been identified, measures for their control must be created. The critical control point concept is practical for the meat and poultry processor and regulator since it sets the limits of what should be achieved when a HACCP program is developed. Experience has shown that there can be significant disagreement on which phases in a process are CCPs, how and how well the CCPs can be controlled, and the level of confidence that the dangers can be avoided when the CCPs are under control.

Table 1. The potential risks and CCPs associated with biological hazards at the of broiler meat production

Stage	Risk Factor	CCP
Chick excrement	Cross-contamination occurs due to inadequate disinfection in vehicles, pallets, floors, walls, roofs, environment, rubber gloves, equipment, poultry houses, infrastructure, and poor hygiene practices due to lack of verification techniques for corrective measures.	No
The process of determining the weight	Cross-contamination occurs due to inadequate disinfection in various areas, poor hygiene practices, and inadequate verification techniques for corrective measures in poultry houses, infrastructure, and other areas.	No
The process of bird desensitization	Cross-contamination due to deficient or inadequate disinfection of the environment, infrastructure, hanging hooks, water tank, and water.	No
The process of feeding and vaccination	Pathogenic diseases may develop through diverse mechanisms, including the contamination of water or feed, transmission facilitated by pests, vaccine failure resulting from inappropriate delivery, or insufficient cleaning and disinfection protocols for crucial equipment such as feeders, drinkers, and curtains.	**Yes**
The process of poultry slaughter	Cross-contamination due to deficient or inadequate disinfection of the environment, rubber gloves, operator equipment, slaughter line, infrastructure, knife, hanging hooks, and poor operator hygiene practices.	No
The process of bleeding chicken carcasses	Cross-contamination due to deficient or inadequate disinfection of the environment, bleeding line, infrastructure, and hanging hooks. Presence of fecal matter on the bird itself and in blood.	No
The process of blanching a chicken carcass	Inadequate disinfection, cross-contamination, blood in scalding water, and high temperature variations were observed during a visit, with operators verifying equipment and inhaling water if the bird is not dead.	No
The process of removing feathers from a chicken carcass	Cross-contamination in the environment, plucking machine, and infrastructure is caused by inadequate disinfection, lack of frequent washing, and feather removal. The chicken carcass is 98% clean, but residues from the machine's difficult-to-access spaces make cleaning difficult.	No
The process of scalding occurring on the legs	Cross-contamination in scalding facilities is caused by inadequate disinfection, high temperature variations, and inadequate infrastructure, but operators verified equipment thermometers during a visit.	No
The process of cutting of carcass legs	Cross-contamination due to deficient or inadequate disinfection of the environment, hanging hooks, equipment, rubber gloves, knives, infrastructure, and poor operator hygiene practices.	No
The process of hanging of chicken carcass	Cross-contamination due to deficient or inadequate disinfection of the environment, hanging hooks, equipment, rubber gloves, infrastructure, and poor operator hygiene practices.	No
The process of gutting of chicken carcasses	Poor hygiene practices, inadequate environmental disinfection, and inadequate equipment led to cross-contamination. Viscera residues, gall breakage, intestine rupture, and spoiled viscera contributed to contamination, resulting in over 30 minutes of bleeding and evisceration delay.	No
The process of pre-cooling of chicken carcasses	Cross-contamination, inadequate environmental disinfection, and high temperature variations were observed during a visit, with incorrect dosage and preparation of disinfectants causing unguaranteed carcass disinfection.	No
The process of chicken carcass cooling	Cross-contamination due to inadequate disinfection, cooling tanks, or contaminated water or ice was observed during a visit, with high temperature variations exceeding 4°C.	No
The process of packaging of chicken products	Cross-contamination occurs due to inadequate disinfection of environment, packaging line, bags, gloves, equipment, baskets, transport cart, infrastructure, and poor hygiene practices of operators, resulting in no hand disinfection during activity changes.	No
The process of loading and shipping poultry	Poor hygiene practices, inadequate environmental disinfection, and high temperatures in the dispatch area contribute to cross-contamination, particularly in the area above 15°C.	No

When obtaining chickens, it is imperative to conduct a thorough examination of the avian specimens upon delivery by the transportation provider in order to ascertain their state of well-being and ascertain the absence of any pathological conditions. This assessment is crucial as it plays a

pivotal role in determining the potential for contamination during subsequent stages of the poultry rearing process. Biological hazards manifest during this phase as a result of potential infection by pathogenic microorganisms. Additionally, vehicles and other factors can contribute to the spread of these hazards. Non-compliance with biosafety measures further exacerbates the risk.

During this phase of the fattening process, the identification of critical control points (CCPs) such as vaccination and feeding is crucial for ensuring the safety of poultry production. Vaccination plays a pivotal role in eliminating biological hazards, particularly diseases like Gumboro, Newcastle infections, and bronchitis, which can have devastating effects on the flock. This proactive approach helps maintain a healthy and disease-resistant bird population [10].

In contrast, the feeding process, while not primarily aimed at hazard elimination, is essential for the overall well-being and growth of the birds. However, it's important to acknowledge that during feeding, there exists the potential for contamination to occur, reaching levels that may become undesirable and challenging to mitigate in subsequent production phases. This makes it imperative to implement strict hygiene and quality control measures during feeding to minimize the risk of contamination and maintain the safety of the poultry products [11].

To ensure that both vaccination and feeding are effectively managed as CCPs, comprehensive monitoring, documentation, and quality assurance protocols must be in place to detect and address potential hazards promptly [12]. This holistic approach contributes to a safer and more reliable poultry production process, safeguarding both animal health and food safety.

Additionally, it's crucial to highlight the importance of training and education for the personnel responsible for executing vaccination and feeding procedures. Proper training ensures that employees understand the potential hazards, the critical control points, and the necessary steps to maintain a high level of biosecurity throughout the process. Well-trained staff can play a significant role in preventing the introduction of pathogens and contaminants that may compromise the health and safety of the flock and the final poultry products [13].

Furthermore, regular audits and assessments should be conducted to evaluate the effectiveness of the CCPs at this phase. These assessments provide an opportunity to make necessary adjustments to the vaccination and feeding protocols based on emerging risks or changing conditions. By continually improving and refining the control measures in place, poultry producers can enhance the overall safety and quality of the meat products, meeting consumer expectations for safe and nutritious poultry [14].

According to Rolhion and Chassaing [3], certain bacteria have the ability to restrict intestinal infections through direct competition for nutrition, leading to the starvation of these competing pathogens. It is evident that comprehensive safety assessment protocols are indispensable for probiotic candidates. These protocols, as summarized from Alayande et al. [2], address crucial aspects such as virulence factors, haemolytic potential, transferable drug resistance, and undesirable metabolic effects.

Currently, a procedural framework has been developed for the introduction of probiotics into the water system. This intervention enhances the immune response and mitigates the presence of infections. Additionally, it is feasible to implement intervention strategies aimed at mitigating the risk of pathogen infection by incorporating bacteriophages into the feed or other similar methods [15]. This is because these operations do not have the primary objective of eliminating or sufficiently reducing the identified hazard to an acceptable level. Additionally, there is a concern regarding the potential for contamination to exceed acceptable levels during these operations. From this point on, we are given a strategy for adding probiotics to the water. This boosts the immune system and lowers the number of germs. The operations that remain, namely unloading and receiving chickens, receiving and fattening, feeding, loading, and transporting chickens to the processing plant, do not qualify as CCP.

Conclusions

In conclusion, an in-depth evaluation of chickens upon arrival is critical for mitigating potential biological threats in the context of poultry husbandry. The identification of Critical Control Points, such as immunization and feeding, is critical for efficient contamination management. The addition of probiotics to the water system, for example, has been found to increase immunological response, supporting a higher degree of safety in chicken production.

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DEVELOPMENT OF BREAD TECHNOLOGY WITH THE USE OF GRAIN RAW MATERIALS

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Bread made with sourdough is the leader among other baked goods in nutritionist ratings. It is a wonderful source of energy and has a low glycemic index. Making bread using sourdough meets environmental requirements. The use of grain mixtures and their individual components helps to increase the nutritional value of bread and the quality of bread. This paper presents the possibilities of developing bread of nutritional value using sprouted components. The article presents the results of the study. Quality and nutritional value of bread with grain mixtures and components. Organoleptic, physical and chemical, microbiological and rheological studies of semi-finished products and bread of high nutritional value using grain components were carried out. It is proven that the