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EFFECTIVENESS AND IMPLICATIONS OF OCCUPATIONAL SAFETY MEASURES AND HYGIENE IN ANIMAL FARMS: A CRITICAL REVIEW

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ABSTRACT
This critical review delves into the effectiveness and implications of employing occupational safety measures and hygiene in animal farms. Evaluating a spectrum of studies, methodologies, and outcomes, this analysis examines the tangible impact of safety and hygiene practices on the well-being of animals, humans, and the environment. The study revealed the effectiveness of the measures that bring about a holistic development of agriculture prioritizing animal and worker welfare, public health, environment, and long-term economic viability.

KEYWORDS: *Occupational safety, hygiene, and welfare.*

INTRODUCTION
Occupational safety measures and hygiene in animal farms refer to practices and protocols implemented to keep workers' and animals' safety, health, and well-being on the farm premises. Ultimately, these measures aim to prevent accidents, injuries, zoonotic illnesses, and exposure to harmful pesticides and chemicals among farm workers. Physical, biological, and chemical dangers can be minimized by the use of personal protective equipment by the animal handlers. In-house training should be done periodically on the safe handling of animals, machinery operation, and quick timely responses to emergencies. Instructions have to be given for the regular maintenance of farm equipment so that they function safely and efficiently. Safety signage, warning labels and barriers have to be implemented in hazardous areas. Noise levels, dust, and ergonomic hazards should be minimal because they greatly impact the health of workers and animals.

Hygiene in animal farms refers to practices and protocols that help to maintain cleanliness, sanitation, and disease prevention for animals and workers in the farm premises. It also promotes environmental hygiene. The spread of diseases among livestock can be kept at bay by regular grooming, cleaning, and monitoring of animal health. Vaccination programs, pest control measures, and proper waste management may reduce contamination. Maintaining the health of animals is not only ethical but also contributes to more productivity and sustainable farming practices. Hygiene among workers includes cleaning and disinfecting farm equipment and handwashing to prevent the spread of diseases.

Adherence to these measures helps prevent the spread of epidemics among humans and is also beneficial for long-term economic sustainability in the farming industry. The farms will benefit monetarily when the number of accidents and injuries decreases. The dairy products will be free from contamination, which will increase consumer trust. Government and regulatory bodies have set guidelines and standards to ensure animal welfare, worker safety, public health, and environmental protection.

REVIEW OF LITERATURE
With a fair scrutiny of several research findings, this critical review aims to provide a comprehensive understanding of the significance of occupational safety measures and hygiene practices at animal farms for the all-round development of the animals, workers, and environment.

A study conducted by C Kelleher, et al.,1999 indicated that workers in small dairy farms suffered from physical and mental health problems because of low perceived susceptibility, and lack of time and resources. Their lack of interest in safety measures and hygiene was attributed to economic constraints (C Kelleher, et al.,1999).

The workers believed that safety training did not benefit them because they would not get any monetary gains. The careless attitude towards their health needs to be changed for the employees as well as the farm workers to better productivity.

Close encounter with animals is the main cause of exposure to biological, physical, and chemical hazards among animal caretakers. The workers suffer from a variety of infectious diseases, zoonotic health risks, high rates of allergic diseases,

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physical injuries, and psychological stress. Therefore, special care and attention have to be extended to these animal handlers. One Health Team comprising a medical practitioner to study the health problem, a veterinarian who is familiar with zoonotic health risks, an industrial hygienist to identify and evaluate hazardous exposures and help devise engineering and work practice controls to reduce them, and biosafety control specialists to focus on zoonotic disease transmission risks can help the animal workers to overcome their occupational risks.

Osborne A. et al., 2012 presented a systematic review of the prevalence of Musculoskeletal Disorders globally among dairy farm workers. The study delves into types of disorders, body parts that are affected, risk factors, and potential preventive measures. The causes of MSDs are repetitive movements, heavy lifting, and prolonged standing. It is important to understand the nature of these disorders for implementing various strategies to improve the overall health and well-being of the farmers (Osborne A. et al., 2012).

S J Hauge et al., 2012 emphasized cleanliness in animals is necessary to ensure hygienic milk production, high microbial quality of carcasses, good hide quality, and animal welfare. The main objective of this study was to identify the factors associated with dairy cattle cleanliness. The study also examined the risks involved in the farms and preventive measures to reduce the risks.

A study by BB Singh et al., in 2013 indicated the complexities and challenges related to maintaining hygiene and health standards for animals in urban areas of India covering issues such as waste management, disease control, and the need for effective veterinary care services in densely populated urban environments. The article explores potential solutions to address these challenges and stresses upon One Health Approach, which requires close collaboration among specialists from all human, animal, and environmental health sectors (BB Singh et al., in 2013).

Clarissa S Cardoso et al., in 2016, conducted an online survey to understand the views of people who were not affiliated with the dairy industry about their perceptions of an ideal dairy farm. Open-ended questions were asked and the responses were recorded systematically. The respondents gave their views on animal welfare, environmental protection, and the welfare of farmers (Cardoso et al., 2016).

Ahmed I, et al., 2020 evaluated the link between hygiene practices and milk quality. Animal hygiene, farm hygiene, and farmer hygiene were found to be necessary to reduce bacterial contamination of milk. The study opines that hygiene is the need of the hour to ensure the production of safe and high-quality dairy products (Ahmed I, et al., 2020).

Ledo J et al., 2021 conducted a study to develop a training program for workers to promote farm safety and hygiene practices in emerging dairy farms. Three teaching and learning methods were adopted: 1) slides and group discussions 2) videos, pictures, and story analysis 3) practical demonstrations. These training sessions improved the knowledge and analysis of farm safety and hygiene.

The article by Ljubisa Mihajlovic et al., 2022 showed significant impact of systematic implementation of preventive and corrective measures on improving hygiene practices and milk hygiene standards in dairy production. The study investigates different strategies that may be conveniently employed to enhance milk quality and reduce contamination risks. This research highlights the significance of training programs, infrastructure improvements, regular monitoring, and feedback mechanisms in promoting adherence to hygiene protocols among dairy workers. The findings strongly opine that there is a direct correlation between rigorous implementation of preventive measures and a reduction in Total Bacterial Count (TBC) and Somatic Cell Counts (SCC) in milk, ultimately leading to superior product quality and consumer safety. Better hygiene practices reduce production losses, increase market competitiveness, and enhance consumer trust. Thus, the integration of preventive and corrective measures helps to elevate hygiene standards and ensure the delivery of safe and high-quality milk to consumers (Mihajlovic, et al., 2022).

Arslan Shuja et al., 2022 conducted a study on using vaccines to immunize animals from many infectious diseases. Therefore, there is a need to develop new vaccines to prevent diseases in animals and also stop their spread to humans (Shuja et al., 2022).

In 1996, The Institute of Laboratory Animal Resources published guidelines for a mandatory occupational health program for personnel who work in animal facilities. All employees working in animal facilities should participate in an AESP (Animal Exposure Surveillance Program). The program educates the employees about the animals they come in contact with daily, their safe handling, and the need to use proper Personal Protective Equipment (PPE). Employees are told to report an injury properly and animal-related allergies and symptoms. (Yolanda C Lang, 2005).

Rosenthal M, et al., 2010 identified various sectors of safety in the zoo that would ensure a safe environment for both humans and animals. The workers were strictly advised to use Protective Personal Equipment (PPE) during their working time for protection from animals and physical injuries. The workers were all told to lift heavy objects in cooperation with others. The staff should be trained for both natural and man-made disasters. The local firemen and policemen should be invited to the zoo to familiarize them with the zoo infrastructure so that they may act quickly during an emergency. The telephone numbers of the fire department and police stations should be prioritized. Fire detectors and fire extinguishers should be kept in a known and convenient place so that they may be used whenever required. The workers should be trained periodically and talked about all safety measures they must compulsorily follow. They must also adhere

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to hygiene practices in the workplace strictly (Rosenthal M, et al., 2010).

Anderson M.E., 2013 delves into the significance of better hand hygiene compliance to control the transmission of pathogens between people, between people and animals, and the indirect transmission between animals via humans. Therefore, sincere efforts have to be made to educate, train, and motivate animal caretakers and veterinary personnel to maintain high levels of hygiene to control infections (Anderson M.E., 2013).

Kumar H.C., et al., 2013 reviewed the problem of zoonotic diseases faced by zoo workers and veterinarians due to their close association with non-domesticated animals in the zoo. These diseases are transmitted either directly or indirectly to the animal handlers. Various solutions have been put forth to reduce the incidence of these diseases. Vaccination and deworming of the animals and humans should be done periodically. Diseased animals should be isolated till they are fit enough to join the herd. Since many diseases are asymptomatic, regular screening of the animals is to be done from time to time to check the presence of any diseases. New animals obtained from different sources should be quarantined compulsorily to ensure that they are free from diseases. Adequate wholesome, safe, nutritious, balanced food and clean drinking water should be given to the animals to enable them to fight against pathogens. Abiotic factors like temperature, humidity, rainfall, and landscape and biotic factors like flora and fauna have a direct or indirect impact on the survival and perpetuation of the disease-causing agents. The plants, lakes, and ponds in the zoo have to be maintained scientifically because they easily become potential breeding places for arthropod vectors. The use of Protective Personal Equipment should be made mandatory for the animal caretakers. Zoonoses cause productive and economic losses, loss of manpower, work hours, money spent on medical care, pain agony, and isolation from social life. Diseased persons are a source of infection in the community. Therefore, zoonoses should be kept at bay and controlled (Kumar H.C., et al., 2013).

Racicot M. et al., 2013 surveyed the best solution for hand hygiene among workers in poultry farms. The hands may be cleaned effectively using soap and water, hand wipes, degreasing wipes, and alcohol-based hand gel to reduce the level of bacterial contamination. But the most preferred solution was the use of warm water and soap (Racicot M. et al., 2013).

Bagaria A. et al., 2014 conducted a study in a large zoo in India to find out the perceptions of disease risk among the animal caretakers and assess the practice being followed to reduce the risk of zoonotic diseases and injuries. It was found that the people handling the animals were not aware of the various zoonotic diseases they may get, the protocol to be followed in the zoo for their safety, the use of anti-venom during animal bites, and the quarantine of diseased animals. The significance of vaccination and Personal Protective Equipment (PPE) was unknown to them. Training sessions and awareness programs for the prevention of zoonotic diseases and injuries were minimal. Animal handlers form a significant workforce throughout the world. Their safety is very important in the workplace. Therefore, all precautions should be taken to protect them from unforeseen hazards in the zoological garden (Bagaria A. et al., 2014).

Personnel who work near non-domestic animals are exposed to specific occupational safety and health risks uncommon to existing industries. To minimize these risks, various control measures have to be implemented which include training on protection from zoonoses and the use of personal protective equipment to reduce animal-related diseases (Z.A., Emilia et al., 2018).

S.K. Korhonen, 2023 conducted a study to analyze the biosecurity measures currently being used in the zoo and recommendations were given for improving the practices to prevent the introduction and spread of infectious diseases in the zoo. Zoo keepers are also recommended to take vaccinations to prevent the spread of infections from humans to animals. Biosecurity training should be organized annually to remind the personnel of the biosecurity measures and to update the workers on new technologies introduced in biosecurity (S.K. Korhonen, 2023).

Adelakun, K M examined the factors responsible for job satisfaction in any organization leading to higher productivity. The survey was conducted in the Kano Zoological Garden, Kano, Nigeria. Three major determinants for job satisfaction were congenial working conditions, b) remuneration, and c) promotion. The workers' expectations from their workplace are greater physical comfort and convenience, job transparency and clarity, cheerfulness and a pleasant atmosphere, good facilities, and adequate working space that boosts their morale and improves their productivity. The workers also expect in-house training regularly for effective service delivery and satisfaction.
Poultry workers suffer from respiratory diseases and allergies. Therefore, care has to be taken to improve ventilation in the poultry enclosures, use devices to reduce respiratory problems, control humidity, add ammonia stabilizers to litter, mechanized washing of the buildings between production cycles, use of aerosolized vegetable oils to bind dust particles, electrostatic precipitators, use of excess fats in the feed, and use of new strains of high oil corn as a feed component (Donham, K.J., 2000).

K.L. MacMohan et al., 2008 suggested various methods to control the spread of Avian Influenza viruses among humans and animals. The poultry workers need to be educated and trained about the viral infection. Good hygiene, work practices, Personal Protective Clothing and equipment, periodic vaccination, antiviral medication, and medical surveillance will help protect against viral infection. Protecting poultry workers is critical for their families, communities, and public health (K.L. MacMohan et al., 2008).

Conan A. et al., 2012 identified the significance of biosecurity measures to limit the number of poultry deaths and discussed the

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biosecurity measures that may be adopted by people raising backyard poultry. They recommended the basic principles of bio exclusion, which is preventing infectious agents from entering the farm, and biocontainment which is preventing infectious agents from existing. These principles could be implemented via thorough cleaning of the farm every day, proper disposal of diseased and dead birds, use of treated poultry manure as fertilizer, and hand hygiene and use of personal protective equipment while handling the poultry (Conan A. et al., 2012).

Kim I, et al., 2014 surveyed the workplace environment and personal protective equipment of poultry farmers. The commonly used equipment was boots, masks, and gloves. The uncommonly used equipment was clothes appropriate for work, quarantine clothes, helmets, and goggles. PPE was usually bought from local market stores which were not appropriate for the actual work environment. Therefore, the workers were prone to physical injuries, allergies, and infectious diseases (Kim I, et al., 2014).

Akinnusi FA. et al., 2018 conducted a study on various poultry farms to find out the practices that need to be religiously followed to prevent and control diseases in poultry farms. Sheds need to be maintained clean, vaccines and drugs to be administered periodically, sheds should be well-ventilated, quarantine of diseased birds to be done compulsorily, educated staff to be employed who understand the significance of hygiene and good management practices, consumption of raw or uncooked poultry products to be avoided at all costs, proper disposal of poultry waste, poultry birds and poultry products to be bought from authorized and certified agents and litter to be managed well (Akinnusi FA. et al., 2018).

The current study was conducted on poultry farms to monitor environmental conditions, determine workers' health status, and assess the implementation of standard management practices.

The 'One Health Approach' can be defined as a multidisciplinary approach to guarantee optimal healthy status for humans, animals, and the environment at the local, national, and global levels. The spread of infectious diseases can be reduced through collaboration among professions such as veterinary medicine, human medicine, environmental conditions, wildlife health, and public health. This approach is still in the initial stage and has a long way to go. (Esha EJ, 2023)

Trine Thorvaldsen et al., 2020 delved into the workplace hazards of aquaculture workers. This article provides new knowledge about workers' health and work environment perceptions. Most workers suffer from musculoskeletal diseases that can be negated by avoiding long work hours, and by providing sufficient rest to the workers between shifts. Manual work can be reduced in the farms for the benefit of the workers. The work environment should ensure safe and healthy working conditions for the workers (Thorvaldsen et al., 2020).

Mina Ziarati et al., 2022 surveyed the zoonotic diseases of fish and their prevention and control. The raw fish should be subjected to thermal or freezing treatment before consumption. Advanced molecular diagnostic techniques should be developed to detect fish-derived zoonotic agents specifically. One Health Approach is useful. Veterinarians must leave no stone unturned to instruct and assist in managing fish-derived zoonoses. Deep bruises should be immediately cleaned with water and treated with disinfectants. Wearing disposable gloves during work hours is of prime importance. Proper use of PPE is recommended. Hand hygiene is necessary at all times. Cleaning and sterilizing the ponds is to be done regularly. Eating raw and undercooked fish has to be avoided. Good infrastructure and a clean and healthy environment are important for the fish and humans (Ziarati et al., 2022).

CRITICAL REVIEW

Occupational safety measures and hygiene in animal farms are vital for protecting workers and animals. Key measures include maintaining equipment, providing protective gear, and training workers. Preventing zoonotic diseases involves vaccinations, biosecurity protocols, and personal hygiene. Ergonomic practices and cleanliness of facilities are crucial for overall health. Challenges include implementation costs, compliance, worker training, and balancing safety with animal welfare. Despite these challenges, effective safety and hygiene practices lead to healthier work environments and more sustainable farming.

CONCLUSION

Maintaining occupational safety and hygiene in animal farms is essential for safeguarding the well-being of workers and animals, enhancing productivity, and supporting sustainable farming. Key practices include comprehensive worker training, the use of protective gear, ergonomic design, and strict hygiene protocols to prevent diseases and maintain clean facilities. Although challenges such as costs and regulatory adherence exist, the benefits of a safe and healthy farming environment greatly surpass these obstacles. A commitment to ongoing improvement in safety and hygiene standards will lead to a more resilient, efficient, and ethically responsible agricultural sector.

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