International Journal of Innovative Research in Computer Science & Technology (IJIRCST)
ISSN: 2347-5552, Volume-10, Issue-2, Mar 2022
https://doi.org/10.55524/ijircst. 2022.10.3.81
Article ID CST1052, Pages 400-404
www.ijircst.org

Study on Microbiological Air Contamination: Poultry Houses

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ABSTRACT- Considering extensive poultry breeding is followed by as comfortable as possible concentration of birds within buildings, this exposes poultry house personnel to increasing proportions to biological aerosol that is mostly created by birds. A product that combines with large concentrations of animals in constrained locations is a significant source of bacterial air pollution, which might pose a substantial health risk to humans. Infective microbial or parasitic agents in fine particulate matter may cause asthma, respiratory problems syndrome, mucocutaneous irritation, respiratory problems, allergic alveolitis natural dust toxic syndrome, including chronic obstructive pulmonary disease. Organic pollution has been linked to the aggravation of asthma, respiratory problems symptoms, mucus irritation, especially chronic bronchitis. Because the microbial air pollution national database for poultry houses is currently insufficient, although commercial broiler is on the rise, it is critical to collect, analyze, as well as update current information.

KEYWORDS- Allergic, Bacteria, Farming, Microbiological, Poultry.

I. INTRODUCTION

In previous decades, intensive poultry farming has grown increasingly widespread in several nations, along with the Netherlands, Denmark, France, USA, Canada, China, and so more recently, Poland. Inhalation of noninfectious bacteria and their components may induce inflammation of the respiratory system, whereas antigens and allergens may trigger the immune system and make allergies. Firstly, this is a health danger to poultry house employees and rural people living in the vicinity to the farms [1]. Furthermore, this dust could also transmit various germs from one livestock barn to another, or through a livestock building to something like a farmhouse and adjacent homes [2].

A. Health Hazards

It is well known that the air in poultry houses is polluted with substantial quantities of different microbial components including metabolites, such as bacterial or fungal cell aggregates, Gram-negative microorganisms endotoxin, fungus 1,3-beta-glucan, fungal spores, and mycelium fragments [3]. They occur as droplets or even as dry particles or are maintained as bio aerosols. Pseudomonas, Pasteurella, Bacillus, Corynebacterium, Leptospira, Vibrio, Enterobacter, Salmonella, Haemophilus, Brucella, Mycoplasma, Yersinia, Staphylococcus, Streptococcus, Micrococcus, Pantoea, as well as Sarcina are some of the bacteria that might be found in this bio aerosol. Bacteria in poultry dust bio aerosol might come from a variety of sources, including soil, feeds, as well as bedding, as well as the chickens themselves. Their large numbers may offer a significant immunological threat to human inhalation [4]. Bacteria are classified based on the elements of their cell walls and the form of their cells. Gram-positive microbes have a thicker cell wall or will be more resistant to bioaerosols, allowing them to survive longer. Gram-negative bacteria, from the other extreme, are often rod-shaped, less resistant, but only capable of thriving in bio aerosols for short periods of time. Endotoxins have been identified in chicken dusting samples obtained at all stages of the poultry production process, according to Crook. Inside the literature, the term endotoxins refers to a lipopolysaccharide complex connected to Gram-negative bacteria's outer membrane. The hydrophobic lipids And the a hydrophilic polysaccharide part (commonly referred to as the "O" region) are the two primary components of LPS. The lipid A component of LPS is responsible for the majority of its biological actions, however the O-region is critical for effective colonization of host tissues. Inhaling endotoxin-contaminated organic dust might cause chronic bronchitis as well as an inflammatory reaction in the lungs. Excessive endotoxin consumption is thought to be connected to immediate inflammatory processes such as organic dust toxicity syndrome, chronic bronchitis, and asthma-like syndrome owing to its top player properties. Such infections are widespread amongst poultry workers [5].

B. Microbiological Air Contaminations in Poultry Houses in Poland and Other Countries

The worldwide scientific collection on air pollution in chicken homes or other ecological farms has grown dramatically in the last decade. The quantity of bacterial contamination in animal habitats, for example, ranges from 104 to 108 cfu/m3, as do the percentages of airborne fungus, according to this study [6]. More precise identification of the sources and composition of microbe contamination issues, and an estimate of their potential biohazard, has been made possible by the development of innovative sampling methodology utilized processes, as well as advancements in human exposure evaluations. Dutkiewicz and colleagues were the first to investigate air pollution in different agricultural buildings for animal or vegetable produce (cowsheds, chicken breeding, grain storage facilities) in Eastern Poland in the mid-1980s. A few dominant groups emerged from the microbes detected in the atmosphere of the agricultural area. Gram - positive or gram rods were three, while Gram negative rods were one. Bacteria, along with actinomycetes or Aspergillaceae

fungi, are considered the most dangerous bacteria that may cause workplace respiratory diseases in farmers [7].
Lugauskas found thirty-one species from thirteen fungal taxa in the air of a chicken house in Lithuania. Six Aspergillus organisms were recovered and identified, with Aspergillus oryzae and Aspergillus nidulans dominating the field, accounting for 16 percent or 9.8 percent of all isolates, respectively. Twelve species of Penicillium fungus were found, with the most common being Penicillium expansum, P. claviforme, P. olivinoviride, or P. viridicatum. Zygomycosis pathogens Rhizopus oryzae, Rizopus stolonifer, or Rizopus nodosus also were discovered. Trichophyton mentagrophytes, a keratinophylic fungus that causes dermatophytosis in agricultural workers, was also found in the chicken house air [8]. In agricultural laborers, the prevalence of opportunistic Aspergillus infections increases the risk of aspergillosis. Radium has been detected in the air of several Swiss, German, Danish, or Spanish agriculture items [14]. In Australian poultry, the air quality is poor. Bacteria concentrations ranged from 1.12 105 to 6.38 106 cfu/m3, according to their findings. There were no thermophilic actinomycetes found, and 85 percent of the bacteria were Gram positive. Airborne fungal concentrations were from 4.4 103 to 6.2 105 cfu/m3. Aspergillus, Cladosporium, Penicillium, Scopulariopsis, Mucor, Fusarium, Epicoccum, Trichophyton, Alternaria, Crysosporium, Ulocladium, Basidiospores, Aureobasidium,Pithomyces, Drechslera, Geomyces, and Rhizomucor were the only genera found. Any use of molecular biology techniques, including PCR, allows for the rapid route of diagnosis with better sensitivity and accuracy, making progress in medical tests, notably in mycology, a potential for actual health assessment.

C. *Production Performance*

- *Milk Yield*

Milk yield is a complex characteristic that is controlled by the interaction of genetic and environmental factors. Coupled with high genetic advance for dairy production at such a younger age is less successful since the feature of dairy production is generally seen at advanced postpartum [9]. Dairy cow milk output is influenced by four factors: genetic aptitude, diet, herd management, as well as health. As cows become more genetically improved, we must improve food but also management to allow the cow to reach her full genetic capability. African cattle, while being late maturing, slow developing, and modest milk producers, respond well to changes in their environment. So, though the cross-breeding with foreign - made breeds, adjustments in the milk and meat of African livestock are desired; relatively minor increment in processing capacity can lead to a significant increase in the efficiency with which contribute heavily are used; and this embodies the persistent work to enhance B. indicus breeds or use imported B. Taurus breeds with considerably large genetic factors effectiveness for milk or meat production [10].

- ***Lactation Length:***

Lactation length is the period of time between two consecutive calvings during which cows may produce milk or lactation. The standard lactation period has been set at 305 days, which roughly corresponds to a cow's best reproductive phase. Both short and long lactation periods are undesirable since they result in income loss. In another investigation, the average lactation time of Butana cattle in Atbara was determined to be 263103 days [11].

- *Rest Period*

The dry season is defined as the time when a cows is not lactating, implying that the term refers to the period when the cow is just not milking. During lactation, a minimum of 6 to 8 weeks of dry period is recommended to rejuvenate secretary tissue or indeed increase body health and milk supply for the first three months of future lactation. A lack of relaxation time resulted in inadequate milk output. One is not desirable in the subsequent lactation, which is exceptionally protracted. Dry cow care that isn't up to pace may lead to lower milk output, more parturient health issues, and decreased fertility.

D. Reproductive Performance

Fertility refers to an animal's ability to produce viable germ cell, mate, conceive, as well as give birth to normal live offspring. Age at adolescence, age upon first calving, or calving interval all impact a cow's lifetime productivity. In the dairy industry, reproduction performance is essential [12]. For herd renewal, the percent calf crop is critical, since production of milk is largely dependent on regular reproductive. The rate of genetic evolution is also linked to the ability to reproduce [13]. The age at first calving, the interval between successive calvings, as well as the potential lifetime output are the three key factors connected to reproductive success . Under station conditions, age at first calving is influenced not only by calves' pace of growth, as well as by management methods such as weight as well as age at first mating, not whether season breeding is used. Calving intervals are influenced by factors including such cow as well as bull fertility, lactation, anestrous, and maybe other lactation-related impacts on fertility. Calving interval is also affected by strategic approach in relation to service time, the amount of services required per conception, or the effects of preceding calving season with the year, as well as the affects of cow ages [14].

- *Age at First Calving*

Mature at first calving is defined as the passage of time since the dam's birth date. The start of a cow's fulfilling life is signaled by first calving, which is highly connected to generation spacing and hence influences susceptibility to selection. Earlier first calving reduces the cow's unproductive life but also shortens the generational difference, allowing for quicker productivity indication [15]. Heifers are normally mated once they are mature enough to withstand the difficulties of parturition as well as nursing in controlled breeding. This increases the chances of conceiving soon after delivery. Breeding is generally uncontrolled in traditional production systems, but heifers were bred at the first opportunity. This often results in longer intervals between calvings. Age at puberty, initial pregnancy, or first calving have low heritability, indicating that these traits are heavily influenced by environmental factors [16].

- *Calving Interval*

The period between two successive calvings; it has an impact on total lactation yield due to its influence on lactation duration. Because the cow is exclusively breastfed for 10 months and then dry for two weeks, the duration between calving must not exceed 12-13 months. If there is indeed a longer gap, the cow's longevity is compromised, resulting in lower output and lees annual return. Many study teams have researched and documented the calving interval in great detail. It is perhaps the best metric of cow herds' reproductive success. The onset of ovarian function in the postnatal period does not always result in conception, consequently approaches for inducing estrus must be assessed in relation to their influence on conception or, indirectly, calving interval [17].

- *Number of Services Per Conception "NSPC"*

The amount of information per conceptions is a breeding effectiveness parameter that is heavily influenced by the breeding strategy used. When unregulated natural breeding is used, it is higher, so when hand-mating or mechanical insemination is used, it is lower. The word should be defined as the amount of services given to group if the value is greater than 2.0 [18] With operations to culled cows incorporated, the number of cows during a specific period divide it by the number of services results in a detectable pregnancy not less than 42 days after service.

- *Gestation Period*

The breeding season refers to the time between fertilization and the birth of a new calf. A corpse's gestation period is usually between 283 and 285 days. Real length, on the other hand, is determined by the cow's age, mating, among individual differences. Cows that are younger and smaller have a quicker gestation period than cows that are older and bigger [19]. Cows with low fertility and late maturation might have a longer gestation period than cows with high fertility or early maturation. The ideal service time preserves the regularity of something like the inter-calving interval, resulting in the cost-efficiency or breeding efficiency of dairy cows [20].

- *Management Program*

Management is critical for dairy farms since animals that are not properly handled will never attain their complete capacity. The profitability is mostly impacted by the productivity of livestock animals or herds as a whole. A diversified agronomic system at the small-holder level is necessary for long-term dairying [21]. Farms in raining agriculture, irrigation, including plantation agricultural production may all be classified as rainy agriculture. Wastewater treatment solutions may be used to construct integrated systems [22].

E. Identification and Recording System

Identification of something like the animals in the herd is a critical component of such a dairy data or records for reproduction, feeding, and selection; calving , culling all depend on exact animal identification. Numbering, moxibustion, ear tags, snow moxibustion, tattooing, and a chain from around cow's neck are all methods of identifying. For registration of livestock with the thoroughbred cattle association or for record keeping of cows on authorized productivity testing procedures, proper identification is necessary.

Successful dairy management necessitates the collection of breeding or calving data. The milk manager will be able properly identify a calf's sire and dam at any time, as well as when the youngster was born, the breeding dates of heifers or cows, and indeed the expected calving date[23]

II. LITERATURE REVIEW

Farmers especially farm laborers, according to Wijnand Eduard, might well be exposure to high levels of airborne soil borne pathogens, including filamentous fungal, as well as microbial elements such as endotoxins. Microbial measurement methods may provide a variety of results, and they need to be enhanced further to allow for personal stash or species confirmation of viable as well as non-viable microorganisms. Farm work entails a variety of tasks and processes that are all exposed to the elements. To determine greater sensitivity in epidemiologic studies of agricultural communities, a large number of measures are necessary. Exposure modeling with numerous exposure drivers is possibly a more efficient technique. As a result, the literature was combed for studies on variables affecting microbe exposure in agriculture. Tasks, process, and/or production have all been studied in the majority of instances. On the other hand, little is known about the other components. It was discovered that media attention to fungi had always been high during wheat, hay, or bedding material handling, particularly when moldy, so when tending cattle; awareness to bacteria was high throughout grain, hay, but rather bedding material handling, as well as in mammal houses; as well as exposure to lipopolysaccharide was significant during bedding substance chopping as well as in animal houses, with the exception of cowsheds. Even amongst trials, there was substantial variation in exposure across evaluations of the same task. In order to improve accuracy of exposure assessment in observational studies and subsequent feature which allows, further study into other determinants of exposure is recommended [24].

Animal production operations are a source of various airborne pollutants, including gases, odour, dust, and pathogens, according to Larry D. Jacobson et al. Degradation of poultry or livestock manure produces gases or odors I shortly after it is generated, (ii) during storage as well as treatment, and (iii) after soil amendment. Feed and animal waste, including as hair, feathers, and dung, make up the majority of particulate matter including dust. In recently expelled manure, microbes that populate the gastro-intestinal systems of animals may be discovered. Various bacteria infiltrate the manure all through the warehousing or treatment processes. Odor, manure gases, germs, particles, as well as other elements are produced at different rates depending on the weather, species, time, or housing, as well as the manure logistics chain, feed kind, or management approach. As a result, predicting the amounts but also emission of these components is very difficult. Pollutants might well be present in livestock and poultry buildings, posing a threat to human or animal health. The majority of these health issues are associated to long-term or chronic exposure to gases, dust, or microorganisms. Acute especially short-term responses to high concentrations of certain components, on the other hand, may be harmful to human or animals. Within a livestock facility, as example, the churning but also pumping of cow manure might produce levels of sulphur dioxide that are lethal to humans and animals [25].

III. DISCUSSION

The findings reveal that environmental as well as managerial factors, rather than hereditary factors, had the greatest effect on the attributes. As a result, it may be decreased by providing enough nutrition to young children as they get older, fertilization of heifers soon after sexual maturity, and reducing hazardous diseases that afflict young calves. It is critical to establish a veterinarian as well as extension analytics service in order to have a healthy herd. It is critical to establish a sound recording system, employing computers because tools in record retention or training employees, since records are the main source of data and are critical for long term planning to maximize the herd's production capacity. As a result, for efficient reproductive control, a thorough collection of data is required. Establishment of an adequate system backed by scientific measures, such as using a breeding plan to replace heifers, rigorous crossbreeding and inbreeding removal, and culling the mediocre cows. Investments in the dairy business is encouraged. Processing and marketing milking facilities, including as refrigerated vehicles, milking equipment, or laboratories, are available.

IV. CONCLUSION

Poultry production methods have progressed to industrialized large-scale production, but studies have revealed that poultry employees are exposed to bio aerosol in substantial amounts. Farm workers including animals might well be exposed to high levels of dust organisms (bacteria and fungus), as well as parasites, which represent a risk of sickness due to their different mechanisms of action. The research on airborne microbes in poultry barns is limited. The reasons may be seen in the relatively expensive pricing of current sample equipment and indeed the widespread use of outmoded methodologies to measure microbiological air quality, such as the very small number of institutions involved in air pollution environmental monitoring. The quantity of microbiological contamination inside chicken houses described in the literature varies a lot, which might be accounted by part either by variable sampling methodologies used in different studies.

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