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College of Veterinary Medicine

Poultry diseases that affect egg production

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بسم الله الرحمن الرحيم

{{ يرفع الله الذين امنو منكم والذين اوتوا العلم درجات }}

صدق الله العظيم
المجادلة (١١)

Dedication

This research is dedicated to my kind parents, Without whom none of my success would have been possible

Acknowledgments

I want to express my special thanks for the efforts of my supervisor ,Assist.professor. Israa Najm Abdullah Al-Ibadi, I also want to thank all of my parents, and brothers who helped me a lot in completing this project

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Section One

Abstract

Common health disorders for poultry industry also have specific effects on egs production. Infectious diseases, which will be among these problems, affect the reproductive system negatively by directly affecting the health status of the animal or animal and decreasing the eggs quality. Especially, bacterial pathogens affect the reproductive system, the avaries and aviduct initially. In fact, it is aimed to emphasize the importance of development of diagnastic methods of diseases, knowledge of epidemiology af diseases, diagnosis of early stage of disease, constantly trained with updated information of disease prevention based on scientific principles to technical personnel.

1.1- Introduction

The laying cycle of a chicken flock usually covers a span of about 12 months. Egg production begins when the birds reach about 18-22 weeks of age, depending on the breed and season. Flock production rises sharply and reaches a peak of about 90%, 6-8 weeks later. Production then gradually declines to about 65% after 12 months of lay. A typical production curve for a laying flock, showing changes in the level of egg production and in egg weight, over time, Many factors can adversely affect egg production. Unravel ing the cause of a sudden drop in egg production requires a thorough investigation into the history of the flock.

Egg production can be affected by such factors as feed consumption (quality and quantity), water intake, intensity and duration of light received, parasite infestation, disease, and numerous management and environmental factors.

There are several issues that can affect egg production in laying hens, including management errors (ighting errors, incorrect temperature settings or ventilation, incorrect feeding equipment errors), and infectious and non-

infectious agents, which can cause sudden and dramatic decreases in egg production
[1]. Among the measures that should be taken to eliminate the cause of the decrease in egg production, recording changes in nutrition, behavior or appearance are primary
[2]. Some of the major health concerns in the poultry sector also affect egg production. Infectious diseases, which can be considered among these concerns, decrease egg production and quality directly by affecting the genital system, or indirectly, affecting the health status of the animals. [1]

research aims

- The aim of this research is to know the causes of bird diseases in the future, the costs of diseases within the poultry industry in the country, the pathological effects, poultry health, and bacterial diseases.

1.2- Avian pathogens in the future

Emerging pathogens are those for which recognition contin ues to occur over time (see Information Note on Emerging Pathogens of Poultry Diseases). These pathogens arise through various genetic mechanisms, including mutation, recombination or co-evolution with vaccines (e.g., Marek's disease virus) or the medications used (e.g, coccidiostats). There is a very high probability that sev- eral new poultry pathogens will emerge during the next ten to 20 years. The most likely candidates are pathogenic variants of avian ribonucleic acid (RNA) viruses, specif cally those Causing infectious bronchitis, Newcastle disease, infectious bursal disease and avian influenza, as well as a hypervirulent form of Marek's disease caused by an avian DNA (herpes) virus, which is arguably the most challenging disease to control in intensive poultry industries worldwide.

Developed poultry industries are characterized by on-site bi- osecurity programmes, which are designed to prevent or mini mize incursions by known infectious diseases. These programmes are supported by close weterinary and laboratory surveillance for poultry health. A newly emergent

1- Spitzer H (2015) An analysis of bacterial contamination of chicken eggs and antimicrobial resistance. Celebrating Scholarship & Creativity Day 77.
2. Clauer PJ (2009) Why have my hens stopped laying? Poultry Extension Specialis, Animal and Poultry Sciences.

disease can therefore most likely be recognized quickly in any developed poultry industry.

However, in countries where poultry production sites still lack adequate biosecurity programmes and access to com- petent veterinary services with laboratory backup, the eco nomic consequences and time needed to identify, control and resolve the problem are much greater The danger is that one or more emerging pathogens become established within a country's poultry populations and then continue to pose a threat as an endemic infection.

1.3- The costs of diseases within a country's poultry industry

Using figures from the United States, Biggs (1982) reported that the total economic costs of disease (including vaccines and con- demnations) were about 20 percent of the gross value of produc- tion (GVP) and about three times the cost of losses from mortal- ity. An analogous 2007 analysis conducted by the University of Georgia, United States, alculated that the GVP of the United States poultry industry in 2005 was US$28.2 billion, and disease losses were 8.2 percent of this. Both studies showed that for each USS1 000 loss due to mortalities, another US$2 000 is lost else- where owing to depressed productivity resulting from disease.(1)

There is little information on the economic consequences of poultry diseases in developing counties. Hence one of the future challenges for these industries wil be to organize the health in- frastructure needed to onduct such analysis. Another will be to move from using frank mortality rates as an economic indicator of losses, to accounting for and then countering the high losses of productivity that result from health-related sub-optimal pro duction.
Infrastructural capacity to diagnose the main causes of disease losses accurately will therefore prove necessary for countries seeking to develop a sustainable poultry industry.[2]

1-Biggs, P.M. 1982. The world of poultry disease. Avian Pathology, 11: 281–300.

1.4- Further disease effects

Respiratory disease complex: Under field conditions, pathogens often interact with not only the host (bird) and its environment, but also one another. For example, day-old chicks arriving infect ed from the hatchery (vertical transmission) and remaining chroi- cally infected for life are susceptible to other respiratory diseases such as infectious bronchitis or Newcastle disease. Fine dust parti- cles in the poultry house air can then combine with superinfection by Escherichia coli bacteria contribute to additional respiratory in- sults, which will produce the (multiple) lesions that are seen at autopsy for complex respiratory disease. Field disease interactions often also involve common immunosuppressive agents, such as infectious bursal disease, Mareks disease or chicken infectious anaemia viruses. These increase the complexity of the disease pic- tures clinically and the lesions observable at autopsy.

Immunosuppression significantly decreases the ability of young poultry to respond effectively to standard vaccinations, and also predisposes them to infection by other specifc pathogens. How ever, sub-cdinical immunasuppression is often not readily appar- ent to the farmer, and therefore a common "silent" cause of significant economic losses. Pathogens causing such infectious disease conditions are termed "erosive" for site productivity (Shane, 2004). In contrast, major pathogens with high death rates and rapid spread such as NDV, 1BDV or HPAJ, although ge- nerically termed "catastrophic" diseases, cause lower economic losses in the longer term than the lower-level but more pervasive and widespread erosive pathogens do. Immunosuppression re sults from a range of known infectious and non-infectious causes.(1)

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To diagnose the causes), competent autopsies combined with systematic on-site investigations of flock production, vaccination history and management practices need to be undertaken. How ever, results from laboratory examinations will often be needed to conf rm a diagnosis. The Information Note on "Poultry Disease
Diagnosis: Field Skills and Laboratory Procedures" gives further detais.

In the context of poultry health and disease control, the gov- ernment of a country that aims to develop a sustainable modern poultry industry MUST THEREFORE also put in place competent field and veterinary laboratory capacity for the diagnosis of poultry diseases. There is a strong need

1.5- Site biosecurity:

the primary key for poultry
Disease control and prevention in business practices

Avian pathogens, which comprise disease-causing bacteria, virus es and protozoan parasites, do not recognize national bounda- ries, only production sites and their disease control circumstances.

The most important measure for sustainable and prof table production on a poultry site is therefore to have forward defences in place i.e., a biosecurity programme whose componernts (see Information Note on “Site Biosecurity and Supporting Strategies for Disease Control and Prevention”) work together to reduce the risk of introduction of poultry pathogens into a production site. For further and pathogen-specific protection measures, the farmer will also need to have correctly applied vaccination pro- grammes for the dangerous (catastrophic) poultry pathogens that are known to be active in that region, such as Newcastle disease virus and virulent infectious bursal disease virus strains. Through this, disease outbreaks can largely be prevented, even if such pathogens gain entry to the site. A second tier of vaccinations – such as against some major

1- Shane, S. 2004. Global poultry diseases update – avian influenza over- shadowing erosive diseases. World Poultry, 21: 22–23.

immunosuppressive and respiratory disease agents (profit-erosive) – is also highly desirable. For poul- try disease control, the most common problem on sites in many developing countries is their overreliance on vaccinations, rather than investing to achieve effective site biosecurity. The primary approach to poultry health on a production site should be to at- tempt to EXCLUDE diseases, rather than allowing relatively ready entry of a pathogen to flocks and then attempting to reduce its effects by immunoprotection, i.e., vaccination.

1.6- Poultry health:

building a network in a
developing country. why should a network approach be taken to poultry health?

Why should a network approach be taken to poultry health?

Because the real challenge for a developing country is to build sustainable poultry disease control systems that can focus and integrate their available professional poultry health resources. Although personal and political networks are often strong, professional health networking and the sense that industry personnel are working with the government sector to achieve common agreed aims can be much less evident. Frag- mentation and duplication of resources and services, along with disagreements as to which (and how) areas of weakness must be strengthened, can mean that little real improvement of overall poultry health is achieved.

A distinguishing feature of the poultry health services in de- veloped countries is the regular exchange of information among industry veterinarians (although their companies will be com- mercial competitors), government health services (laboratory and field) and often the universities in a region. Such communication and cooperation occur regularly, for example, quarterly within a soundly developed industry, because it is recognized that the mu- tual benefits of communicating about poultry health matters far outweigh the collective losses from silence.

How can the government agencies of a developing country position themselves to accelerate the development of a poultry industry?

Experiences gained in developed poultry industries worldwide have demonstrated that investing State resources in a central poultry health facility/unit with designated functions can provide an integrated special-purpose vehicle for delivering avian health-in-production services.

Government agencies and all industry stakeholders stand to benefit. Interaction between government and industry rep- resentatives is therefore essential for successful design and planning, and also later, when periodically reviewing the unit’s performance in health and disease control.

Industry might well contribute to financing this, for example, by providing funding for major pieces of laboratory equipment or other infrastructure that it expects will provide high benefit to itself. However, the guid- ing principle must be to achieve focused and integrated health functions for the unit to produce the health outputs needed to support sustainable poultry production in the developing country concerned. Avian veterinarians should also have pivotal roles in the poultry industry, through protecting both poultry and human health (see Information Note on “Veterinary Roles in Health and Knowledge Transfer across a Poultry Industry”).

The primary thrust for senior government personnel, in part- nership with industry, should be the planning of human resources to strengthen laboratory and extension skills for integrated ac- tivities that can deliver appropriate health services across the four sectors of the country’s poultry industry. Proof of success will be visible evidence of the private sector choosing to use government services.

Investment in the construction of large purpose-built buildings or a stand-alone new facility should not be seen as the primary aim of this exercise. However, some low-cost special-purpose additions to an existing laboratory may significantly enhance the functional capacity of that unit. Examples could include the strengthening of microbiological health surveillance, or a simple building for secure maintenance of a small specified pathogen- free (SPF) poultry flock. Production of SPF eggs and chickens can then enhance local investigations, including with experimental reproduction of field diseases.

The overriding goal for the central poultry services unit is to be accessible and cost-effective for the veterinary and technical personnel who service commercial poultry pro- duction operations, particularly small and medium-sized farming enterprises. The modus operandum should be fee- for-service.

There will however be a clear responsibility for the services provider to direct and develop its staff resources adequately, to ensure that the services offered are relevant to the needs of the developing industry. The interfacing of industry and government poultry health production activities can then help to drive both (Bagust, 1999; Information Note on “Veterinary Roles in Health and Knowledge Transfer across a Poultry Industry”). For develop-ing countries, there is another interesting development prospect:

if government laboratory-based services are of sufficient quality, [4](1)

the large-scale intensive industrial operators may choose to pay for using those services. This scenario is not a fantasy – in Viet Nam some industrial poultry companies have been submitting samples to a government regional diagnostic laboratory on a fee-for-service basis, thereby gaining access to the expertise of government staff in enzyme-linked immunosorb- ent assay (ELISA) serological testing.

When quality services are achieved, additional benefits will be-
gin to flow at the national level.

First, the central poultry unit will provide a natural focus for poultry health planning by industry and government, through its functioning in laboratory services, disease intelligence and field extension-outreach. Second, it can also act as a viable interface for health intelligence between commercial industry sectors that have the commercial imperative and economic means to minimize the risk of disease introduction, and the village (family) poultry sector risk to commercial sectors. Although village-based poul- try are cearly quite separate from commercial enterprises, it will be vital to include this sector in health services and surveillance.Family-based village poultry production is currently undertaken by a majority of families in rural regions in many developing coun- tries, and contributes very significantly to poverty alleviation and food security

1- Bagust, T.J. 1999. Poultry health research and education in China for sustainable and profitable production Y2000+. Proceedings of the First International Conference on Veterinary Poultry: Beijing, 28–30 July 1999, pp. 61–69. Chinese Animal Husbandry and Veterinary Science Association.

Section Two

2.1- Bacterial Diseases

Colibacillosis

This is a disease that is characterized by colisepticemia, hem- orrhagic septicemia, coligranuloma, air sac disease, swollen head syndrome, venereal colibacillosis, cellulitis, peritonitis, salpingitis, osteomyelitis, yolk sac infection and enteritis caused by the avi- an pathogenic Escherichia coli (APEC) of the Enterobacteriaceae family. APEC is often isolated from avian species, while 01, 02, 08,015, 018, 035, 078, 088, 0109 and 0115 serogroups of the 0 antigen are usually isolated. 02 and 078 are serogroups that are usually isolated and comprise 80%h of the cases worldwide [1]. E coli is present in the gastrointestinal tract of most animals and it is excreted in high amounts through feces [2]. After intake, its coloni- zation in the trachea, caecum and oviduct takes around 21 weeks [3].Transmission can occur through contact with infected animals or through the intake of water and feed contaminated with feces, as well as via the inhalation of agents from dust and bedding ma- terials [3]. Transmission can also occur when oophoritis and sal- phingitis develop in laying fowl breeds, prior to the formation of the eggshel, or after it has been formed while passing through the cloaca [2}

Inflammation in the oviduct due to APEC results in the reduction of egg production and sporadic mortality [5]. Exudate, which accumulates with the inflammation that occurs as a result of egg peritonitis causes formation of egg yolk that coagulates in the body. In addition, colisepticemia, which affects egg production, can often be seen in young laying hens, but rarely in mature animals [4].[5]

Salmonella Infection

These are infections caused by Salmonella Gallinarum (S.Gallinarum) and Salmonella Pullorum (SPullorum), and include pullorum disease (PD), fowl typhoid (FT) and infections of chicks and hens that are characterized with septicemia [1]. Adult fow! are prone to fowl typhoid, while young fowl are prone to pullorum disease. The transmission sources of Salmonella Gallinarum (S.Gallinarum) are hatcheries, feed and poultry houses [2-3]. On the other hand, Salmonella Pullorum(S. Pullorum) transmission can occur within 48 hours of hatching, in which case shell penetration and feed contamination occur at a lower rate [3]. S.Pullorum localizes in the reproductive tract of layers, and more densely in the ovary and oviduct with sexual maturation [1]

Amorphous and cystic follicles can cause minimal lesions such as na noduies or regression ot ovaran tocies anu ca be seen wHen chronic hiection Occurs. in this case, the oviduct fills with a caseous exudate, causing the disfunction of the ovary and oviduct thus leading to peritonitis [1].

Fowl Cholera

This is a septicemic disease or domestic and wid ow wt high mortality and morbidity rates, caused by Pasteurella multo c- da (Ë multocido) af the Pasteurellaceae family [4]. Adult chickens tant to the disease than lavers, resulting in deaths at higher rates in laying hens [5]. Transmission accurs

1. Dho-Moulin M, Fairbrother JM (1999) Avian pathogenic Escherichia coli (APEC). Veterinary Research, BioMed Central 30: 299-316.
2. Porter ER (1998) Bacterial enteritidis of poultry. Poult Sci 77: 1159- 1165
3. Swayne DE, Glisson JR, McDougald LR, Nolan Lisa, Suarez DL, et al. (2013) Diseases of Poultry. (13th edn) Blackwell Publishing Ltd., Iowa, USA.
4. Mushin R, Weisman Y, Singer N (1980) Pasteurella haemolytica found in the respiratory tract of fowl. Avian Dis 24: 162-168.

through the digestive tract, resplratary tract, SKIn and conunctiva, and is particulary transmitted through the feces ar aral/nasal discharge of animals that have recavered from the infection [4]. The avaries are infect content is released into the peritoneum as soon as the follicles ruprure. 1ne stroma or unmatured tacies and ovanes are ny per emic, which leads to a decrease in production in laying hens [4}. [6]

Gallibacterium anatis infection

Gallibacterium anatis (G. anatis) of the Pasteurellaceae family was known previously as Pasteurella anatis [1]. Gallibacterium has been reported in many countries around the world [2], with age, stress, weakened immunity status and hormonal factors all being effective in disease occurrence. In addition to chickens, oth- er avian species, such as duck, turkey, pheasant a partridge, are prone to G. anatis [3-4]. The horizontal route is effective in the transmission of the disease. Although uncommon in the Pasteu rellaceae family, trans-ovarian infection, which supports vertical transmission, has been proven for G. anatis [5], and this was con- firmed in particular with the isolation of the agent from the yolk sac of a four-day old chick. A decrease in egg production is seen in the peak period of chickens caused by lesions such as folliculitis, and ruptures and hemorrhagic follicles that occur in the genital tract of adult laying hens [6-7].

Infectious Coryza

Chickens are natural hosts of the agent Avibacterium para- gallinarum (A.paragallinarum) [1]. The disease is characterized by a swelling around the eyes and face. The agent is transmitted through secretions and

1. Mushin R, Weisman Y, Singer N (1980) Pasteurella haemolytica found in the respiratory tract of fowl. Avian Dis 24: 162-168.
2. Grimont Pad, Grimont F, Bouvet P (2000) Taxonomy of the Genus Sal- monella, In: Salmonella in domestic animals. Wray C, Wray A (Eds.), CABI Publishing, New York, USA, p.1-17, cap.1,
3. Anom (2009) Fowl typhoid and Pullorum disease.
4. Shivaprasad HL (2000) Fowl typhoid and pullorum disease. Rev Sci Tech Off Int Epiz 19: 405-424.
5. Mirle C, Schöngarth M, Meinhart H, Olm U (1991) Studies into incidence of Pasteurella haemolytica infections and their relevance to hens, with particular reference to diseases of the egg-laying apparatus. Monatshe e fuer Vet Med 46: 545-549.

excretions between animals. Transmission can also occur through the exchange of machinery/equipment between farms, and also by personnel [2]. It causes a 10-40% decrease in egg production. Morbidity of the disease is 80-100%, while mortality is around 10% [3].
7

Mycoplasma Infection

Mycoplasma synoviae (MS) and Mycoplasma galisepticum (MG) are the cause of mycoplasma infections, for which chickens are natural hosts MG causes chronic respiratory infections l8]. The primary symptoms are coughing, panting, slight opening of the beak and reduction in feed intake [1]. Decrease in egg produc- tion, co-inflammation of the cornea and conjunctiva, facial edema and tear secretion are clinically apparent [2]. Oviduct thickening and salphingitis in laying hens are considered to be causes of de- creases in production. Chicks that hatch from the eggs of infected animals play a significant role in lateral transmission. The most significant route is transmission through eggs. Vertical transmis- sion through infected eggs is observed [3-4].
MS infection is seen in chickens older than 4 weeks of age. It is usually an upper respiratory tract infection [1]. Strains isolat- ed in recent years were frequently isolated from flocks with de- creased egg production and egg defects [3-4]. The agent causes the eggshell to become thinner, to lose opacity and to develop a rough surface. Thus, eggs tend to crack or break more easily. The agent causes more than 10% of eggs to be unfertilized as well as a decrease in egg production [2].

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1. Anom (2009) Fowl typhoid and Pullorum disease.
2. Bisgaard M, Korczak BM, Busse HJ, Kuhnert P, Bojesen AM (2009) Classification of the taxon 2 and taxon 3 complex of Bisgaard within
Gallibacterium and description of Gallibacterium melopsittaci sp. nov.,
Gallibacterium trehalosifermentans sp. nov. and Gallibacterium salpin-
gitidis sp. nov. Int J Syst Evol Microbiol 59: 735-744.
3. Neubauer C, De Souza-Pilz M, Bojesen AM, Bisgaard M, Hess M (2009) Tissue distribution of haemolytic Gallibacterium anatis isolates in lay- ing birds with reproductive disorders. Avian Pathol 38: 1-7.
4. Singh AV, Singh BR, Sinha D K, OR VK, Vadhana AP, et al. (2016) Galli-bacterium anatis: An Emerging Pathogen of Poultry Birds and Domi- ciled Birds. J Veterinar Sci Techno 7: 1-7.
5. Gast RK, Shivaprasad HL, Barrow PA (2008) Salmonella infections. Saif YM (Eds.), Disease of poultry (12th edn), Blackwell Publishing, Iowa,
USA, pp. 619-674.

Ornithobacterium rhinotracheale(ORT) Infection

HjhmThis is a contagious, fatal respiratory disease that causes growth deficiency. Its natural hosts are chickens and turkeys [5].
ORT can be transmitted vertically, but also horizontally through aerosols or drinking water. The agent can be isolated from the ovary, oviduct, hatching eggs and unfertilized eggs. A production decrease in commercial layers, an increase in the number of eggs of smaller size than normal and changes in shell quality are among the clinical symptoms of the disease [5].[8]

2.2- Conclusion

It has been demonstrated that egg production loss can be attributed to several causes other than management error in establishments, with infectious agents led by bacterial and viral diseases emphasized in particular. When infectious factors affecting egg production are considered individually, the measures to be taken in poultry houses should be considered more significant than the treatment of disease. All efforts aimed at controlling disease agents should be considered within the scope of biosecurity, including the prevention of entry of disease agents into the establishment, the prevention of transmission of the disease to healthy animals in the event of a disease outbreak, the taking of measures to prevent contaminated materials from disseminating into the environment and the elimination of disease agents from the environment are necessary. Accordingly, every poultry house/establishment should prepare a biosecurity plan. A protection, control and eradication program should be implemented with information obtained from a monitoring of the diseases that affect egg production. In this regard, the development of disease diagnostic methods, the gaining of knowledge of disease epidemiology's, early disease diagnosis and training of technical personnel with new and updated information are considered necessary.

1- Swayne DE, Glisson JR, McDougald LR, Nolan Lisa, Suarez DL, et al. (2013) Diseases of Poultry. (13th edn), Blackwell Publishing Ltd., Iowa, USA.
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5. Van Empel PCM, Hafez HM (1999) Ornithobacterium rhinotracheale: A review. Avian Pathol 28: 217-227.

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