Conditions affecting egg production in chickens

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Abstract: The review on Conditions affecting egg production in chickens aimed to collect and update available information about these conditions from clinical point of view which can help for better understanding. Egg production is a target of raising layer chicken flocks. Layer chicken flocks are breeders for fertile eggs (either broiler or laying hens breeders) or commercial eggs for human consumption. Egg production (quality and quantity) can affected by many Conditions including non-infectious (Bird, Managemental, Environmental factors) and infectious (Bacterial, Viral, Mycotic and Parasitic). It could be concluded that infectious or non-infectious causes resulting in severe economic losses. Prevention and control of such causes by improve management and sanitary conditions, prevention by vaccination for viral causes, proper antibiotic medication for bacterial causes will be resulted in improve and maximize condition of production.

[Kh M Elbayoumi, M. M. Amer, Nagwa S. Rabie, Mona S. Zak. **Conditions affecting egg production in chickens.** *Rep Opinion* 2019;11(9):8-17]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). http://www.sciencepub.net/report. 2. doi:10.7537/marsroj110919.02.

Key words: egg production – infectious disease – Managemental factors – environmental factors- viral diseases – bacterial diseases – mycotoxine – parasitic infestation.

Introduction:

Egg production is a target of raising layer chicken flocks. This eggs can be used for human consumption or egg by product for other industries (e.g. glue [commercial eggs]) or production of one day old chicks (fertile eggs) in case of breeder flocks either broiler or laying hens breeders flocks. Commercial eggs suitable for human consumption must be full fill human health requirement and should be with normal egg shape, size, weight according bread, clean from outside with good shell quality, free from blood spots (caused by very large eggs or salpingitis), free from meat spots (caused by salpingitis), odourless with no taint (as odour caused by either ransed oil in ration or fish meal…etc), free from antibiotics residues, mycotoxine residues, free from microbes causing feed poisoning (e.g. salmonella) and of low cholesterol content (and now there is free cholesterol eggs). On the other hand fertile eggs that used for production of one day old chicks (layers or broilers) should be with normal egg shape, size, weight according breed, clean from outside to avoid microbial contamination and low hatchability consequently, of good shell quality with suitable pore size to avoid dry of fertile egg in the hatchery and suitable shell strength together with containing high levels of maternal antibodies which provides 1 day old chicks with passive antibodies required for protection for first three weeks of life for most prevalent chickens pathogens (e.g. infectious bursal disease IBD, Newcastle disease ND, Avian Influenza….etc). Each chicken breed has an egg production curve varied in start point (21-24 week of age) to reach maximum egg production age (34-36 week) which then reached economical production age (70-80 week) after which the flock should be replaced by another one. Eggs produced from female reproductive system which is consist of left ovary and oviduct, While male reproductive system consists of two testicle inside abdomen and vasdifferance. Sex maturation depends on effect of light which stimulate sex hormones FSH and LH [FSH: follicular stimulating hormone, LH: leutilizing hormone]. There are many factors that affecting egg production resulting in drop in egg production for transient period whiles other lead to continuous reduction.

Condition affecting egg production
Either one of the following causes:-

A. Managemental factors.
B. Environmental factors.
C. infectious diseases which includes:
-Bacterial causes.
-Viral causes.
-Mycotic affections.
-Parasitic infestation.

A. managemental factors:

Ration formulation:-

As ration poor in available protein, Ca, Ph., vit. D. may lead to decrease in either quantity or quality of egg produced ***(Pelicia et al., 2009)***.

Quantity and quality of drinking water:-

If a bird not reaches optimum quantity of drinking water egg production rate will decrease or stop completely ***(Ahmed and Alamer 2011)***. Also water quality may affect egg production as hard water may affect egg production, also high salts in water may chelate or binding Ca or disturb Ca-Ph ratio in the ration ***(Castro et al., 2009)***.

Light:

Each breed has its own lighting program starting from day old chick till end of production cycle. Artificial lighting is widely used in poultry reproduction, both in the production of hatchable eggs and of commercial eggs. Light is required for the release of hormones responsible for reproduction; however, the best lighting practices to stimulate laying poultry during the reproductive period still need to be determined as duration and light intensity (watt/m²) changes from slandered per each breeds may affect egg production ***(Jacome et al., 2014)***.

B. Environmental factors.

High temperature resulting in decrease food intake consequently results in decrease egg production Moreover stress factors such over stocking density, lack of sufficient laying cages may increase number of broken eggs ***(Lara and Rostagno 2013)***.

C. Infectious Diseases:

I- Bacterial causes:-

Salmonella gallenarumpullorum infection:

It is infectious, egg transmitted disease of poultry, especially chickens and turkey characterized by white diarrhea and high mortality in young birds and by asymptomatic adult carriers, caused by *S. pullorum* which is non motile gram-negative bacillus. This organism is resistant and can survive for months but can be killed by many disinfectants including formaldehyde gas ***(Kabir. 2010).*** Lesions include oophoritis (inflammation of ovarian follicles) as ovarian follicles found to be bloody, cheesy or atrophic follicles, the disease affect both quantity (decrease egg production) and fertility and hatchability ***(Saha et al., 2012).***

Control based on culling of positive bird as it should be total condominated together with disinfection of fertile egg in order to produce free flock ***(Shivaprasad, 2000)***.

Avian Mycoplasmosis (*Mycoplasma gallisepyicum* infection):

Bacterial disease of chicken and turkeys, is often associated with one or more pathogens such as infectious bronchitis IB ***(Ayim-Akonor et al., 2018)***, Newcastle disease virus NDV ***(Bolha et al., 2013)***, low and highly pathogenic avian influenza ***(Samy and Naguib,2018)*** or bacterial complications such as E. coli ***(Xiao et al., 2013)***.

Vertical transmission results from naturally infected hens. The highest rates of transmission were found during the acute phase of disease as peak egg transmission at 3-6 weeks post infection in more than 50% of the eggs. Organism isolated in specific media which the colonies has its characteristic appearance (fried egg appearance) and serological diagnosis using tube agglutination test ***(Armour and Ferguson-Noel 2015).***

treatment using antibiotic sensitivity test as in vetro several antibiotic showing sensitive to the organism especially macrolides with many generations including advanced generation on the other hand complete elimination of the organism by antimicrobial therapy is an unrealistic expectation ***(Kreizinger et al., 2017).***

Coryza (Infectious Coryza):

Acute or subacute bacterial disease of chickens, pheasant and guinea fowl characterized by conjunctivitis, oculonasal discharge, swelling of infra-orbital sinuses, edema of the face, sneezing and sometimes of the lower respiratory tract. Prolonged outbreaks may be due to complication by other diseases especially *Mycoplasma Gallisepticum* infection ***(Sandoval et al., 1994)*** causing what it called complicated chronic respiratory disease complex.

The disease caused by *Hemophilus Paragallinarum* which is Gram-negative, bipolar-staining, non motile rod with a tendency toward filament formation, the organism is not very resistant organism as it persists outside the host for only a few days and so it is easily destroyed by many disinfectants and by environmental factors. The organism required V-factor (nicotinamide adenine dinucleotide), which is available in chocolate agar medium and can grow on blood agar ***(Akter, 2012)***.

The disease is characterized by rapid onset and high morbidity in flock, decreased feed consumption, and decreased egg production, oculonasal conjunctivitis, edema of the face, respiratory noise, swollen infraorbital sinus, and exudates in the conjuncivital sac ***(Eaves et al., 1989)***, treatment:- in vetro sensitivity bases many antibiotic are effective for treatment such as macrolides group ***(Han et al., 2016).***

II- Viral causes:

A- Avian Tumor viruses:

Avian Tumor virus infections are including Marek’s disease, Avian leucosis/sarcoma viruses and Reticuloendotheliosis virus.

1- Marek's disease:

Marek’s disease (MD), caused by Marek’s disease virus (MDV), is a commercially important neoplastic disease of poultry which is only controlled by mass vaccination, Several MDV pathotypes have been characterized over the years based on morbidity and mortality rates These pathotypes can be distinguished into three subfamilies (GaHV-2, GaHV-3 and MeHV-1) based on biological and genomic similarities: GaHV-2 (RB-1B, Md5 and CVI988/RISPENS), GaHV-3 (SB-1) and MeHV-1 (HVT; FC-126). The three serotypes have considerable antigenic cross-reactivity. ***(Gimeno et al., 1999).***

MeHV-1 also known as the Herpes Virus of Turkey (HVT/FC-126) is non-pathogenic in chickens and turkeys but can induce viremia, which is associated with the induction of protective immunity against MD. Chickens infected with HVT become persistently infected and maintain long-lasting immunity. Outbreaks after the onset of egg production in vaccinated flock have been called "late Marek's". Marek's disease prevention by vaccination via injection at 18 days of embryonation or at hatching revaccination is not necessary and immunity is usually lifelong ***(Boodhoo et al., 2016).***

2-Avian leucosis/ Sarcoma viruses:

Avian leukosis virus (ALV) is a highly oncogenic alpha-retrovirus of Retroviridae family, causing avian leukosis (AL) in chickens. ALVs can be classified as endogenous (ALV-E) and exogenous (A, B, C, D, and J) based on their mode of transmission, host range, viral envelope interference, and cross-neutralization patterns ALV-J was first isolated from meat-type chickens in 1988, and has primarily been associated with myeloid leukosis (ML) in broiler breeders. In recent years, however, various tumors including hemangiomas induced by ALV-J have emerged among parent and commercial layer flocks, leading to enormous economic losses, and indicating an evolution of ALV-J oncogenicity ***(Malhotra., 2015)***.

Vertical transmission is most important mechanism of spread and eradication is preferred method of control vaccines to immunized parent stock where avian leucosis virus has been eradicated is being considered as a means to provide maternal immunity to progeny chicks ***(Gao et al., 2016).***

3-Reticuloendotheliosis (RE):

RE is caused by retroviruses (differ in morphology, structure than avian leucosis) and is a term of a variety of syndromes including arunting syndrome and a chronic lymphoma and both are of economic importance. The reticuloendotheliosis viruses (REVs) comprise several closely related amphotropic retroviruses isolated from birds. These viruses exhibit several highly unusual characteristics that have not so far been adequately explained, including their extremely close relationship to mammalian retroviruses, and their presence as endogenous sequences within the genomes of certain large DNA viruses ***Niewiadomska Gifford (2013)***.

All retroviruses replicate their genomes via a DNA intermediate that is integrated into the nuclear DNA of the host cell and is referred to as a “provirus.” Occasionally, infection of germ cells allows retroviral proviruses to enter the host germline, so that they can be vertically inherited as host alleles, called *endogenous retroviruses* (ERVs). No method for control or treatment have been reported only eradication programs and strict sanitation are of great value for control of the disease ***(Weiss, 2006)***.

B- Avian viruses:

1- Newcastle disease:

Newcastle disease (ND) is one of the most important zoonotic avian diseases that significantly affect poultry production all over the world c belonged to family paramyxoviridi ***(Alexander,2001)***. From its first official report in 1926 at Newcastle Upon Tyne in England to date, ND has accounted for tremendous economic losses through numerous epidemics associated with high mortality, high morbidity, and many other production related losses. Consequently, the World Organisation for Animal Health (OIE) has included it among the list of diseases that require immediate notification upon recognition ***(OIE, 2012)***. The aetiology of the disease is Newcastle disease virus (NDV), a negative stranded RNA virus whose 15.2 kb nonsegmented genome is organised into six genes encoding six structural proteins, namely, NP, P, M, F, HN, and L, as well as two nonstructural proteins, V and W ***(Murulitharan et al., 2013)***. Among these proteins, the F is generally considered to be a molecular marker of NDV virulence. According to the OIE, virulent NDV strains are diagnosed as those possessing multiple basic amino acid residues (arginine and lysine) at the F protein cleavage site located between amino acid positions 112-116, and a phenylalanine residue at position 117. On the other hand, isolates of low virulence are considered to be those with monobasic F cleavage site and a leucine residue at position 117 ***(OIE, 2012)***. Unfortunately, this is not a universal rule of thumb, as some NDV strains adapted in wild birds such as pigeons and doves have been shown to be minimally pathogenic despite possessing the so-called polybasic F cleavage site ***(Kim et al., 2008).***

In layers cause severe drop in egg production within few days. Eggs laid are of low quality, outbreak in layers may takes place in spite of strict vaccination programes in, mortality rate ranged from 76.80 to 84.41% in different flocks, Necropsied birds lesions including petechial hemorrhages on the proventricular tips, intestinal lumen with necrotic areas covered with hemorrhages, hemorrhagic cecal tonsils, para-tracheal edema, mottling of spleen with varius inflammatory lesions in ovaries. The characteristic histopathological lesions were mainly seen in the blood vessels and lymphoid tissues. Vascular changes characterized by congestion, edema, and hemorrhage were found in majority of the organs. Lymphocytolysis in spleen and cecal tonsils was evident ***(Mariappan et al., 2018).***

Chickens and turkeys can be immunized by proper vaccination protocol including live and inactivated Newcastle vaccine according type of production, conventional ND vaccines have stood the test of time by demonstrating track record of protective efcacy in the last 60 years. However, these vaccines are unable to block the replication and shedding of most of the currently circulating phylogenetically divergent virulent NDV isolates. Hence, rationally designed vaccines targeting the prevailing genotypes, the so-called genotype-matched vaccines, are highly needed to overcome these vaccination related challenges. Among the recently evolving technologies for the development of genotype-matched vaccines, reverse genetics-based live attenuated vaccines obviously appeared to be the most promising candidates ***(Bello et al., 2018)***.

2- Avian Influenza (AI).

It is a viral disease affecting the respiratory, enteric or nervous system of many poultry species and characterized by a short course and extremely high mortality. All Influenza viruses hemagglutinate chicken red blood ***(Peacock et al., 2017).***

Avian influenza A viruses (AIV) are the causative agents of the presently most important poultry disease. caused by Influenza virus belonged to orthomyxoviruses and there are three types A, B, C and all avian influenza viruses have type A antigen. Most strains of AIV are designated low pathogenic (LP) and cause minimal illness in chickens, as well as in wild waterfowl and shorebirds, but infection results in high levels of virus shedding, efficient spread among susceptible hosts, and perpetuation of the agent. Other AIV strains are classified as highly pathogenic (HP) and are restricted to members of the H5 and H7 subtype. HPAIV classification comes from the ability to cause severe morbidity and mortality in domestic fowl and more recently has caused mortality in wild waterfowl, mammals, and humans ***(Sturm-Ramirez et al., 2004)***.

Wild aquatic birds, especially of the orders *Anseriformes* (ducks, geese, and swans) and *Charadriiformes* (shorebirds, gulls, terns, and auks) are the natural reservoirs of avian influenza (AI) viruses ***(Webster et al., 1992)***. These AI viruses are highly host adapted, typically replicating in epithelial cells of the gastrointestinal tract and producing subclinical infections. Periodically, these AI viruses transmit from wild aquatic to domestic birds, producing subclinical infections or, occasionally, respiratory disease and drops in egg production, with such transmission and infections being most permissive for domestic waterfowl species (***Swayne and Slemons., 2008)***.

Virus has two important surface antigens, hemagglutinin (H) and neuraminidase (N), Eighteen hemagglutinin (HA) and 11 NA subtypes of influenza A viruses are found in nature, HA subtypes are further subdivided into two groups: group 1 includes H1, H2, H5, H6, H8, H9, H11, H12, H13, H16, H17, and H18; group 2 includes H3, H4, H7, H10, H14, and H15 ***(Russell et al., 2008)***, Sixteen HA and nine NA subtypes circulate in the aquatic birds of the world, where they replicate primarily in the intestinal tract at the higher body temperature of birds (40 °C), have a target-cell receptor preference for α2,3 sialic acid, and are spread primarily by fecal–oral transmission through water. Two HA and NA subtypes of influenza A virus are found in bats; they have not been cultured but can be detected by polymerase chain reaction (PCR), cause in apparent disease, and do not attach to sialic acid residues. ***(Tong et al., 2013)***, while, Influenza B viruses have a single subtype with two lineages (Victoria and Yamagata). Although influenza B viruses have been detected in seals, they are primarily confined to humans.

Influenza viruses H5N1 cause severe drop in egg production with high mortality and in laying turkey are associated with abnormal egg shell pigmentation and quality, while H9N2 influenza virus is a primary pathogen in layer hens, and that its replication in the infundibulum is responsible for acute and chronic lesions that limits the effective functionality of the oviduct, decrease egg production with compromising the commercial life of birds ***(Bonfante et al., 2018)***

Control is largely through prevention of exposure to Influenza viruses through migratory carrier birds or infected birds either directly or indirectly ***(Elmberg., 2017)***, moreover highly pathogenic avian influenza virus (HPAIV) of subtype H5N1 causes a devastating disease in poultry but when it accidentally infects humans it can cause death. Therefore, decrease the incidence of H5N1 in humans needs to focus on prevention and control of poultry infections. Conventional control strategies in poultry based on surveillance, stamping out, movement restriction and enforcement of biosecurity measures did not prevent the virus spreading, particularly in developing countries. Several challenges limit efficiency of the vaccines to prevent outbreaks of HPAIV H5N1 in endemic countries. Alternative and complementary approaches to reduce the current burden of H5N1 epidemics in poultry should be encouraged. The use of antiviral chemotherapy and natural compounds, avian-cytokines, RNA interference, genetic breeding and/or development of transgenic poultry warrant further evaluation as integrated intervention strategies for control of HPAIV H5N1 in poultry ***(Abdelwhab and Hafez 2012).***

3- **Avian encephalomyelitis (AE; Epidemic Tremor).**

AE is an infectious viral disease affecting young chickens, pheasants, quails, and turkeys ***(Suarez 2013)***. The disease is characterized by ataxia and rapid tremors. The transmission of AE virus (AEV) infection generally occurs by vertical transmission, namely through infected eggs (egg transmission) or by horizontal transmission, namely through the fecal–oral route. Mature hens may experience a temporary decline in egg production; however, they do not develop neurological signs. Meanwhile, the morbidity rate in young stock is generally 40–60% if all chicks come from the infected flock. The mortality rate averages 25%; however, it may exceed 50% ***(Suarez 2013).***

AEV, a member of the family *Picornaviridae*, features a small positive-sense, single-stranded RNA genome ***(Marvil et al., 1999).*** This genome, which is 7 kb nucleotides in length, comprises a 5′-untranslated region (5′-UTR) followed by a long open reading frame encoding a large polyprotein. AEV includes four structural proteins (VP-4, VP-2, VP-3, VP-1) from the P1 region and seven nonstructural proteins from regions P2 and P3 ***(Lau et al., 2014)***.

Clinically, AEV infection reveals similar symptoms as several other diseases, such as Newcastle disease, Marek's disease, rickettsial diseases, vitamin B1 or B2 deficiency, aspergillosis, salmonellosis, coccidiosis, omphalitis, and mycoplasmosis ***(Suarez 2013)***. For the differential diagnosis, isolation and identification of the causal agent are extremely important. In general, intracerebral inoculation of 1-day-old chicks and yolk-sac inoculation of specific pathogen free embryonated chicken eggs are performed to diagnose the AEV infection ***(Tannock and Shafren, 1994):***; however, these methods are extremely laborious and time-consuming. To conquer this problem, molecular methods such as reverse transcription-polymerase chain reaction (RT-PCR) are useful for rapid diagnoses ***(Goto et al., 2019).***

In spite of many successful trials of recombinant vaccine traditional commercial vaccine still used in field for protection against field challenge (***Sarma et al., 2019)***.

4- Infectious Bronchitis (IB):

IB is an acute, highly contagious viral disease of chickens characterized by respiratory signs (gasping, sneezing, coughing, and nasal discharge), severe renal disease associated with nephrotropic strains, and marked decrease in egg production with change in egg quality, it caused by coronavirus, does not hemagglutinate chicken RBCs as occurs with ND and AI. There is great antigenic variation among IB strains and many serotypes of the virus have been identified as Some IB viral strains have a distinct predilection for renal tissue and these nephrotropic strains can also induce significant mortality ***(Lin and Chen 2017)***.

In Egypt, IBV isolates are mainly divided into the Egy/Var I, Egy/Var II and Mass type groups. The Egy/Var I and Egy/Var II variants, which recombined from the original Egyptian variant and the Israeli strain, are grouped with Middle Eastern IBV strains. In addition, these variants showed high virulence in one-day-old SPF chickens, with 50% mortality. Furthermore, another study on Egy/Var type isolates identified a deletion at position 63, a substitution at I69A/S, and an additional *N*-glycosylation site in the S1 protein ***(Zanaty et al., 2016)***.

IB may cause marked drop in egg production markedly up to 52% and the effect on production can last 6-8 weeks or longer. Egg quality affected as eggs are often soft-shelled or miss happened. Egg albumin may be watery and shell irregularities these may persist long after an outbreak of IB ***(Ignjatović and Sapats, 2000).***

Chickens that had IB virus infection or a severe reaction to IB vaccine when less than 2 weeks old may suffer permanent damage to the oviduct develop what called false layer ***(Amarasinghe et al., 2018)***.

Prevention by vaccination using modified live virus vaccine in young chickens and should be repeated at least once in broiler chickens 12 days intervals while in layers or breeders repeated different times for priming, while Inactivated virus vaccines administrated by injection to breeders or layers from 14-18 weeks of age. If live vaccines caused post vaccinal reaction (airsacculitis) suitable broad spectrum antibiotics added to food or water will minimize the airsacculitis and reaction ***(Jordan, 2017)***.

5- Pneumovirus Infection (swollen head syndrome SHS or Metapneumovirus MPV infection)

MPV is a member of the virus family Paramyxoviridae, is an important respiratory virus of poultry caused by turkey rhinotracheitis virus as sub-population of the TRT virus adapted to chicken as in turkey causing rhinotracheitis while in chicken causing SHS. The disease was spreading by direct and indirect contact, while egg transmission had not been detected. ***(Cook, 2000)***. The virus emerged in the 1980s and is thought to have spread to various regions around the world through migratory birds ***(Cook, 2000)***. the disease causing respiratory signs and facial oedema in broiler chickens 4-6 weeks of age while in broiler breeder or layers clinical signs appears only in 1-3% of the flock and there were decrease in egg production between 1-10%. ***(Cook et la., 1999)***. Control via vaccination and improving management beside control of secondary bacterial infection using suitable antibiotics can help in control viral infection specially I turkey and breeder chickens ***(Cook, 2000)***.

6- Egg Drop Syndrom (EDS76)

EDS76 is an duck adenovirus from Group 3, The virus was 1st time discovered in 1976 in the Netherlands, It causes a drop in egg production, as well as the production of defective eggs, can lead to severe economic losses for poultry farmers, it is an infectious viral disease of laying hens caused by a hemagglutinating adenovirus and characterized by loss of color in pigmented eggs and failure to achieve production targets or by production of thin-shelled or shell-less eggs ***(Hafez, 2011)***.

EDS is a viral disease of layer birds, found mainly during peak production causing high economic losses ***(Begum et al., 2013)***. EDS mainly attacks layers that are in the reproductive ages of 25-26 weeks ***(Dinev, 2012)***. Ducks and geese are reservoirs of the EDS virus and are the sources of virus transmissions through contaminated water ***(Cfsph, 2006)***. The EDS disease is characterized by specific symptoms of decrease in the quality and quantity of eggs during peak production. Low egg quality is characterized by small size egg with mushy eggshell which can be easily broken ***(Kencana et al., 2017)***, which leads farmers to huge economic losses, moreover the disease cause interanuclear inclusions in reticuloendothelial cells in the spleen or intestine ***(Mohapatra et al., 2017)***.

EDS virus initially infected breeding farms and later on spread to other farms through infected eggs ***(Su et al., 2011)***. Egg drop syndrome virus has become endemic in various parts of the world, It is a strategic infectious disease that must be eradicated by condamination of infected flock or prevented by vaccination of layer before laying ***(Gutter et al., 2008)***.

7- Infectious Laryngiotracheitis (ILT)

ILT is an acute viral disease of chickens, pheasants, and peafowl characterized by marked dyspnea, coughing, gasping and expectoration of bloody exudates, all ages are susceptible but most out breaks in chickens occur more than 4 weeks of age in mature or nearly mature chickens. the disease caused by a herpes virus, is a highly contagious virus of poultry that can cause severe respiratory disease, high morbidity 50-70% with mortality usually is in the 10-20% range and significant reduction in egg production in layers, The virus persists in infected birds for life ***(Bagust et al., 2000)***. Once the virus is present in a farm environment, it becomes extremely difficult to remove, due to its ability to become latent ***(Hughes et al., 1991)***. Because of this, vaccination against ILTV is not routinely carried out, as the live ILTV vaccine brings with it the risk of introducing the virus into the region. The virus infection leads to the formation of type Aintranuclear inclusions observed in scattered groups of tracheal epithelium. Similar inclusions occur in the infected chorioallantoic membrane of ECE and chicken embryo cell cultures ***(Parra et al., 2016)***.

8-Mycotoxicosis and Mycoticeffections.:-
Mycotoxicosis.

Mycotoxicosis is a disease caused by a toxic fungal metabolite. It may affect both humans and animals. Poultry mycotoxicosis is usually caused by fungi that colonized and invades grains and foods, but other environmental aspects may be involved, mycotoxins includes aflatoxicosis, citrinin, ergotism, ochratoxicosis, oosporein, trichothecene (fusariotoxicosis), zeralenonemycotoxicosis ***(Ismaiel and Papenbrock 2015)*** Mycotoxin affecting quality of egg specially ochratoxicosis as it causes shell less egg, moreover toxine residues in egg youlk known to be carcinogenic for human being ***(Fouad et al., 2019),*** control by using ration free from mycotoxins together with adding suitable antimycotoxine in feed or water.

9- Parasitic infestation.

Chronic parasitism as internal parasites (long cestode (Tape worm)-Ascardia) and external parasites (specially ticks) is one of the causes of decrease in egg production as it either cause anemia indirectly resulting in decrease egg production ***(Lesh and Brady 2019):*** or irritate laying hens so lay outside the nest resulting in increased number of broke the egg ***(Dudde et al., 2018)***. Treatment using special parasitic anthelmintic for internal parasite or use effective parasiticides (ticks) beside improves housing conditions ***(Maqbool et al., 2017)***.

Conclusions

It could be concluded that there are many factor affecting egg production including quality and quantity, they either infectious or non-infectious causes that resulting in severe economic losses, control by improve management and sanitary conditions, prevention by vaccination for viral causes together with proper antibiotic medication for bacterial causes will results in control of this condition for great extent.

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12/3/2019