Egypt. J. Vet. Sci. **Vol. 52,** No. 3, pp. 275-282 (2021)

Egyptian Journal of Veterinary Sciences
https://ejvs.journals.ekb.eg/

The Influence of Harmful Greenhouse Gases (GHG) Emission In-Door of Broiler Chickens' System on Their Health: "Options of Prevention and Control"

Asmaa N. Mohammed[1], Amir Abdel-baky[2], Eslam Ashraf[2], Moustafa Hamdy[2], Ahmed Helmy[2], Mina Mahrous[2], Mohammed Anower[2], Mohammed Khaled[2], Mohammed Abdel-Haseeb[2], Mahmoud Moustafa[2], Mohammed Fateh-elbab[2], Yousef Fayez[2], Mohammed Hassan[2], Mohammed fouad[2] and Mohammed Abdellah[2]

[1] Department of Hygiene, Zoonoses and Epidemiology, Faculty of Veterinary Medicine, Beni-Suef University, Beni-Suef 62511, Egypt.

[2] 5th years undergraduate students, Faculty of Veterinary Medicine, Beni-Suef University, Beni-Suef 62511, Egypt.

NOWADAYS, greenhouse gases (GHG) pose a threat to the veterinary world as an air pollution problem. This review article discusses the impact of GHG on both chickens and human health in broiler chicken farms. Aside from an effective method of preventing and controlling the phenomenon. Numerous factors influence the rate of gas emissions, including nutrition type, feed conversion rate, and waste management. The harmful gases on-farm production involving carbon dioxide, nitrous oxide, and methane that affect workers' health as well as the hazards that result from frequent exposure to those gases were stated. Reduced stocking density of birds inside buildings, enforced ventilation, hygienic disposal of wastes (liquid, solid manure, and poultry mortalities), litter, and nutritional treatment will alleviate GHG emission and reduce the likelihood of exposure, thereby relieving the load on both bird and worker health at the farm level.

Keywords: Greenhouse gases, Global warming, Poultry health, Control options.

Introduction

The poultry production systems are exposed to various problems related to air pollution. It is imperative to preserve ideal circumstances for the poultry industry and protect the environment from destructive gas emissions. To achieve the most beneficial environment, farmers must apply the best ways of advanced technologies. In poultry housing, the environment is a mixture of complex factors that co-operate with each other as a complex dynamic system [1].

The interaction between both poultry production and gases released in the building of poultry includes complex processes. The rate of emission is affected by numerous considerations involving the type of nutrition, feed conversion rate, and managing practices [2]. The feed intake, the conversion rate efficiency, and management can affect the properties of the manure (physical and chemical) including pH, oxygen percentage, chemical composition, microbial populations, and the percentage of moisture content [3].

Gaseous impurities are produced during the decomposition of fecal material depends on the efficacy of ventilation, stocking density,

Corresponding author: Asmaa N. Mohammed, E.mail: asmaa.mohamed2@vet.bsu.edu.eg, Tel. 01227525459
(*Received* 10/03/2021; *accepted* 14/04/2021)
DOI. 10.21608/ejvs.2021.66839.1221

and animal movement. Gas emission from broiler fattening is affected by the type of litter, management practices, temperature, and relative humidity. One kilogram of chicken meat causes 3.2 kg of equivalent GHG emissions approximately [4]. Besides, the capabilities of egg production require a variety of management practices, that can create a good condition for achieving the target [5]. Nevertheless, in various production systems, the contamination of the environment is not very evident beside the system's ability to protect the micro-environment to poultry health, and production efficiency. This article discussed the main causes of GHG emissions in poultry chicken farms, their sources, their effect on poultry health, and how to prevent and control this problem, besides the negative effects on the health of both chickens, and human beings.

The main causes and sources of greenhouse gases emission

There are primary causes of gas emission including the time of manure storage, the sticking density of housed bird, floor area covered with filths, the efficiency of a ventilation system, air movement, moisture%, pH, and feed composition [2,5-7]. The carbon dioxide source is natural gas combustion, and decomposition of manure besides animal respiration [8-9]. Methane (CH_4) is produced in ruminants meanwhile; in poultry, it originates from the decay of excrements. The stored manure or organic matter with high concentrations is considered a major cause of methane [10]. Year round, the concentration increases by about 1% in the atmosphere [11].

The harmful effect of gases emission including greenhouse gases

Raising houses of broiler chickens were checked for hazardous gases concentration such as (ammonia, carbon dioxide, nitrous oxide, and methane). Year round, the NH3 level concentration in broiler chickens increased to 10.77 mg/m3 during fattening periods. No doubt that, in livestock and poultry buildings, the emitted GHG is CO_2, water vapor, and CH_4 whereas the context is focusing the highlight on them during this article. The daily CO_2 concentrations were lowered during this period, they were encouraged by heating and breathing. The concentration level of N_2O was 8.24 mg/m^3 while CH_4 level was 134.12 mg/m^3 [12]. Besides the greenhouse gas emission concentrations and distribution in different sectors as shown in Table (1 and 2) according to U.S. Energy Information Administration [13]. In the traditional poultry industry, the surrounding environment is influenced by gas emissions and climate change. Whilst at the farm level, NH_3, CO_2, N_2O, and CH_4 are mostly produced. Ammonia is a harmful gas and has hazardous effects as shown in (Fig. 1**)** as described by Abebe [14]. Regarding, CH_4, CO_2, and N_2O reasons for warming of the atmosphere [15] and causing global warming [16] as displayed in (Fig. 2)**.** The urination of birds is one of the causes of NH_4. In addition, it created during decomposition of organic materials by bacterial action in the birds building [17-18]. It is creating odors, contributes to acid rain formation that harmfully alters the nature of atmospheric air [19].

Greenhouse gases emission

Carbon dioxide (CO_2)

The foremost source of CO_2 in breeding farms is the expiration of animals, burning of gas for heating, and decay of organic materials [15]. In broiler and pullet dwellings, the high production of propane may be used to warm the houses during cold weather [20]. In birds, CO_2 production is relative to their metabolic heat creation. Under normal conditions, the daily CO_2 production has normally varied for farm animals [21]. During bird expiration, CO_2 was found (147 kg/h) approximately. CO_2 production of chickens was influenced by the fattening period.

The CO_2 emission from the chicken house was 247 kg/h in the initial production periods and reached 459 kg/h in the final period. The continuous working of electric heater is responsible for approximately 39 kg of CO_2/h. Emissions of CO_2 in-door were noticeably affected by the aeration rate. There is no variation in emissions of CO_2 gas during fattening periods [15]. The average release of CO_2/bird during the fattening period was10.4 kg meanwhile CO_2 rate was 73.11 kg/year. Calvet *et al.,* [20] recorded that during summer and winter, the average rate of emission/ bird was 3.84, and 4.06 g, respectively.

Methane (CH4)

Methane is one of the GHG of concern to climate change. Methane is an odorless, and colorless gas that arises in large quantities in nature. It is the easiest element in the paraffin cycle and amongst the most powerful of the GHG. During the anaerobic decomposition of vegetable matter, CH_4 is produced. Waste management practices are related with CH_4 production [22]**.** In the oxidation manner of methane, Hydroxyl radicals can eliminate CH_4 by reacting with it

TABLE 1. Factors affecting greenhouse gases Emissions.

Type of activity	Carbon dioxide (CO_2) emission	Methane (CH_4) emission	Nitrous oxide (N_2O) emission
Water	0.8 kg CO_2/m^3	1.25 g CH_4/m^3	0.125 N_2O/m^3
Feed	3.2 kg CO_2/kg	264 g CH_4/ton	35 g N_2O/ton
Electricity	1.0 kg CO_2/kWh	0.0109 kg CH_4/MWh	0.0083kg N_2O/MWh
Manure	4.2 kg CO_2/kg	318 g CH_4/ton	42 g N_2O/ton
Bedding	1.64 kg CO_2/kg	126 g CH_4/ton	63 g N_2O/ton
Transportation	2.65 kg CO_2/ liter	0.0333 g CH_4/miles	0.0134 g N_2O/miles

-According to Environmental Protection Agency [**13**]

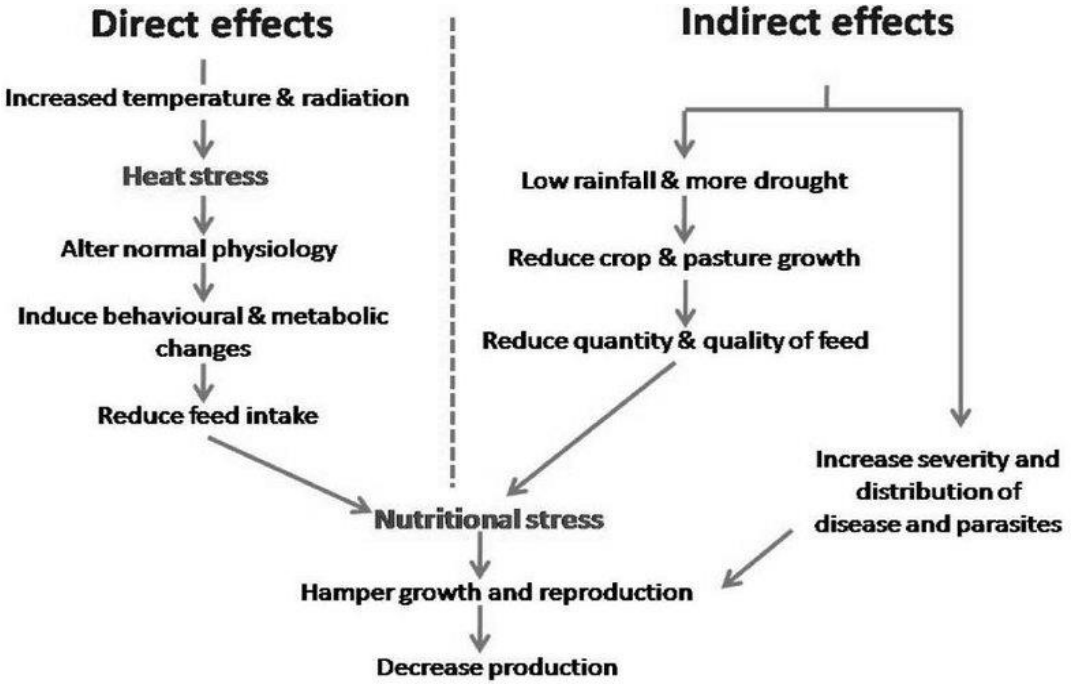

Fig. 1. Impacts of climate change on the poultry production [14]

to produce CO_2 and water vapor, and efficiently extending the lifespan of the environment. In methane exposure, the symptoms are Suffocation whereas inhaling high concentrations of CH_4 can remove O_2 from the internal body as CH_4 displaces it. There are significant efforts in atmospheric modeling and attempts to constrain CH4 source strengths to regulate methane, as well as a need to delineate the processes responsible for the vast variations in methane emission rates.

Oppositely, methane is not the only air pollutant; Methane, on the other hand, is not the only air pollutant; it also contributes to the formation of smog and harmful air contaminants that have been related to cancer, cardiovascular, and neurological damage. In addition to minimizing harmful heat-trapping emissions, sanitary and ventilation measures, as well as adequate drainage systems, are included in the protection measures to minimize smog-forming pollutants and toxins [23].

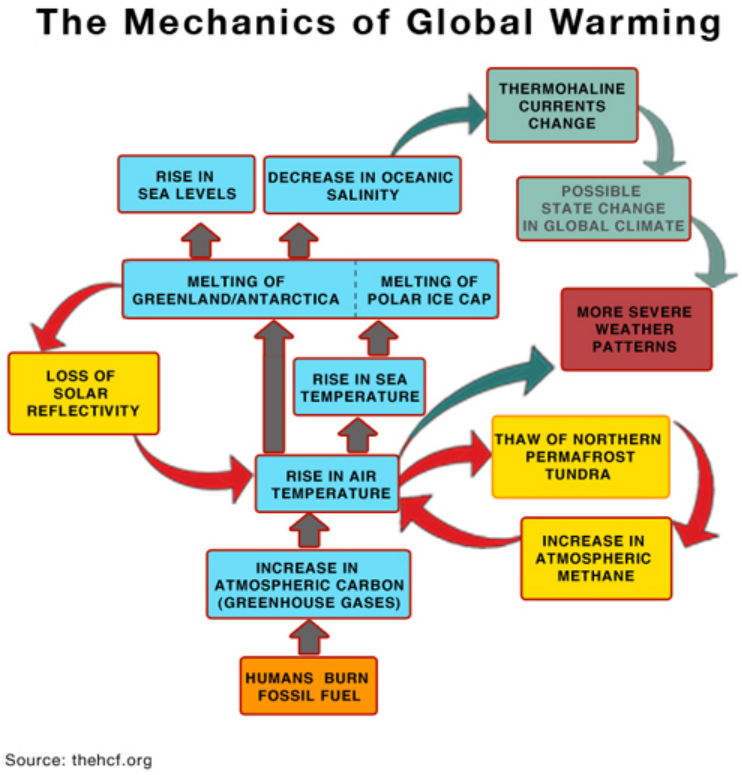

Fig. 2. The mechanics of global warming [16]

TABLE 2. Greenhouse gas emission from broiler chicken production.

Type of activity	Carbon dioxide (CO_2) emission	Methane (CH_4) emission	Nitrous oxide (N_2O) emission
Water	695.36	1086.5	108.65
Feed	1,529,792.0	126,207.84	16,732.1
Electricity	29,665.63	323.36	246.22
Manure	1,665,342	126,090.18	16,653.42
Bedding	479,798.4	40,633.74	20,316.87
Transportation	115,289.12	93.092	37.46

-According to Environmental Protection Agency [**13**].

Nitrous oxide (N_2O)

It is a potent greenhouse gas "GHG" [24], capable of causing "global warming" than CO2. Nitrous oxide has a long lifetime in the atmosphere and greatly contributes to "global warming". NO_2 is transformed into NO which decomposes "stratospheric ozone", which protects the Earth from destructive UV rays. The nitrogen cycle in agriculture is linked to N_2O. Nitrogen can be exchanged to N_2O in agricultural systems through the "nitrification–denitrification process". Previous literature Meda et al. [25] recorded that emission of N_2O per chicken daily was 46 mg, and for 60 days reached 2.8kg/bird compared to Calvet et al. [20] who found that in both the summer and winter seasons, N2O levels were 1.74 and 2.13 mg/h/bird, respectively. Dolan *et al.,* [26] obtained that N_2O levels were 0.409mg/kg/1h on the 30th day, despite a body weight of 1.92 kg/bird, two days before the end of fattening.

Mitigation options of air gases Emissions

Mitigation of air gas emissions from poultry housings requires too much attention and is possible to achieve. Elevated concentrations of noxious gases are causing bad environmental conditions for the chickens, attendants, and neighbors inside the poultry shelter. The most important thing that can be done to reduce gas pollution is to change the way chickens are housed and how organic matter is treated.

Organic matter management

In the agricultural sector, greenhouse gas emissions at 13% produced from manure management. The production systems of farms in the last periods, moved from a deep pit to manure belt systems [27]. Furthermore, capital costs for manure belt are typically higher (50%) than for high-rise manure removal systems. Whilst manure belt has significant advantages. Manure of low moisture content is exhibited its ability to emit a lesser amount of NH_3 [28]. To recognize the kind of housing of the least effect on the bird's environment, Fournel *et al.,* [27] stated a relative survey displayed on GHG emissions and measured their concentrations in different cage layer housing. The findings revealed that liquid manure emits more gases of greenhouse effect than solid manure from belt housing in various housing systems. Frequent removal of dry matter material proved to be one of the contributing factors.

Air cleaners

Air cleaners are installed in broiler and/or layer housing. It contains a plastic filter that is sprinkled with a liquid that captures NH_3. Approximately 58 percent of the volume of discharge usually released through the chimney is stored [29]. Fans are used in housing systems to quickly evacuate dirty air through ventilation. Effect curtains or a biomass stack-wall can be used as part of the procedure. Harmful pollutants, on the other hand, are just scattered, not eliminated. Environmental buffers made of plants have also been used to reduce the harmful impact of exhaust air on the environment [30].

Nutritional management

Dietary handling decreases ammonia secretions by lowering extreme nitrogen emission and adjusting pH of manure, while Liu et al., [31] found that a nutritional ration with reduced crude protein resulted in a yearly reduction in NH3 emissions with no adverse impact on egg development. The other literature also establishes that, while dietary treatments may reduce losses in the form of gaseous emissions, litter or excreta composition may not represent differences in gaseous losses, and thus may not serve as a pointer for lowering air emissions through feeding processes. Bio-alginates are also used positively in the veterinary medicine. The capability of these bio-alginates to attract catabolic gases, especially NH_3, that is generated throughout digestion, and nitrogen compound transfer, is intriguing [32].

Litter amendments

Straw, which includes wood shavings, is the most common litter ingredient in poultry farms. The accumulation of manure, waste forage, and feathers in the litter, resulting in a nutrient-rich substrate, it could be used as a fertilizer source in the future. Via the composting process, the method of storing manure influences NH3 emissions [28-33]. Higher emissions will result from spreading the manure in thin layers rather than stacking it in thicker layers. Higher emissions are linked to higher moisture content, as well as a warmer ambient temperature. Redding [4] contrasted the capacity of bentonite to minimize NH3 losses from poultry drop litter volatilization. The use of bentonite may inhibit nitrogen deficiencies, resulting in a more effective input material for fertilizer production [34]. Mohammed and El Bably [35] recently discovered that adding natural zeolite to poultry litter at concentrations between 10 and 20 g/kg is extremely efficient in reducing NH3 and CO2 levels. Furthermore, they noticed the non-existence of H2S.

It has been concluded that, mitigation of GHG emissions is an environmental concern that is becoming of increasing importance for governments and professionals in the poultry sector. Poultry farms play a major involvement in air pollutant emissions such as ammonia (NH_3), carbon dioxide (CO_2), and methane (CH_4) emissions**.** The utmost active habits to avoid the in-door GHG include adapting poultry housing and organic matter handling besides nutritional management, litter amendment, air cleaners, lowering the stocking density of the building, enforced ventilation, and proper disposal of waste inside the farms will alleviate the destructive greenhouse gases.

Acknowledgement

All thanks and appreciation to the 5th year students that are trying to participate in the text of this review article.

Conflict of interest

The authors do not have any competing interests.

Funding statement

This review Article is a self-funding

References

1. Hobbs, P.J., Webb, J., Mottram, T.T., Grant, B. and Misselbrook, T.M. Emissions of volatile organic compounds originating from UK livestock agriculture. *J. Sci. Food Agric.*, **84**, 1414–1420(2004). DOI: 10.1002/jsfa.1810.

2. Coufal, C.D., Chavez, C., Niemeyer, P.R. and Carey, J.B. Nitrogen emissions from broiler measured by mass balance over eighteen consecutive flocks. *Poult. Sci*., **85**, 384–391 (2006). DOI: 10.1093/ps/85.3.384.

3. Xin, H., Gates, R.S., Green, A.R., Mitloehner, F.M., Moore, Jr, P.A. and Wathes, C.M. Environmental impacts, and sustainability of egg production systems. *Poult. Sci*., **90**, 263–277 (2011). DOI: 10.3382/ps.2010-00877.

4. Redding, M.R. Bentonite can decrease ammonia volatilization losses from poultry litter: laboratory studies. *Anim. Prod. Sci*., **53**, 1115–1118 (2013). DOI: 10.1071/AN12367.

5. Mihina, Š., Sauter, M., Palkovičova, Z., Karandušovska, I. and Brouček, J. Concentration of harmful gases in poultry and pig houses. *Anim. Sci. Pap. Rep*., **30**, 395−406 (2012).

6. Knowlton, K.F. Ammonia emissions: the next regulatory hurdle. *The Jersey J.,* **47**(10), 56−57 (2000).

7. Wheeler, E.F., Casey, K.D., Zajaczkowski, J.S., Topper, P.A., Gates, R.S., Xin, H., Liang, Y. and Tanaka, A. Ammonia emissions from U.S. poultry houses: part III– broiler houses. In Proc. 3rd International Conference on Air Pollution from Agricultural Operations (pp. 159–166). St. Joseph: American Society of Agricultural Engineers, (2003).

8. Knižatova, M., Mihina, Š., Brouček, J., Karandušovska, I. and Mačuhova, J. Ammonia emissions from broiler housing facility: influence of litter properties and ventilation. XVII the World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR). *Canadian Society for Bioengineering (CSBE/ SCGAB) Quebec City,* Canada, June 13−17, (2010a).

9. Nicks, B., Laitat, M., Vandenheede, M., Désiron, A., Verhaeghe, C. and Canart, B. Emissions of ammonia, nitrous oxide, methane, carbon dioxide and water vapor in the raising of weaned pigs on straw-based and sawdust based deep litters. *Animal Res.*, **52**, 299−308 (2003).

10. Patterson, P.H. and Adrizal, A. Management strategies to reduce air emissions: Emphasis–dust and ammonia. *J. Appl. Poult. Res.,* **14**, 638−650 (2005). DOI: 10.1093/japr/14.3.638

11. Baylis, K., Paulson, N. and Shaw, P. The potential of livestock- based offsets to reduce GHG emissions, in greenhouse gases and animal agriculture conference, October 3-8, Banff, Canada, 4 (2010).

12. Weiske, A. and Petersen, O.S. Mitigation of greenhouse gas emissions from livestock production. *Agric. Ecosyst. Environ.*, **112**(2): 105−106 (2006).

13. Environmental protection agency. Emission factors of greenhouse gas inventories. (2015). https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors 2014.pdf (accessed 23 November 2017)

14. Abebe, E. Impact of climate Variability and change on food security and local adaptation strategies in Arsi-Negel Woreda central rift valley, Ethiopia. Unpublished master's Thesis, Addis Ababa University, Ethiopia (2013).

15. Knižatova, M., Brouček, J. and Mihina, Š. Seasonal differences in levels of carbon dioxide and ammonia in broiler housing. *Slovak J. Animal Sci.,* **43**, 105−112 (2010b).

16. How do greenhouse gases cause global warming? https://www.thehcf.org/report-3-how-do-greenhouse-gases-cause-global-warming.

17. Richard, P., Devinney, T., George Yip, G. and Gerry Johnson, G. Measuring Organizational Performance: Towards Methodological Best Practice. *J. Manag.*, **35**(3), 718-804. DOI: 10.1177/0149206308330560

18. Misselbrook, T.H., Van der Weerden, T.J., Pain, B.F., Jarvis, S.C., Chambers B.J., Smith, K.A., Phillips, V.R. and Demmers, T.G.M. Ammonia emission factors for UK agriculture. *Atmospheric Environ.,* **34**(6),871-880(2010). DOI.10.1016/ S1352-2310(99)00350-7.

19. Becker, J.G. and Graves, R.E. Ammonia emissions and animal agriculture. Mid-Atlantic Regional Water Quality Program. University of Maryland, College Park. Agricultural Ammonia Forum, Woodstock, VA, March 16, (2004).

20. Calvet, S., Cambra-Lopez, M., Estelles, F. and Torres, A.G. Characterization of gas emissions from a Mediterranean broiler farm. *Poult. Sci.,* **90**, 534–542 (2011). DOI: 10.3382/ps.2010-01037.

21. Pedersen, S., Blanes-Vidal, Jorgensen, H, Chwalibog, A., Haussermann, A., Heetkamp, M.J.W. and Aarnink, A.J.A. Carbon dioxide production in animal houses: a literature review. *CIGR J*., **10**, 1−19 (2008).

22. Whiting, G. and Chanton, J. Primary production control of methane emission from wetlands. *Nature*, **364**, 794–795(1993). https:// doi.org/10.1038/364794a0.

23. McCabe, D., Geertsma, M., Nathan Matthews, N., Lesley Fleischman, L. and Darin Schroeder, D. Waste Not Common-Sense Ways to Reduce Methane Pollution from the Oil and Natural Gas Industry. (2014). https://www.ccacoalition.org/en/ resources/waste.

24. Oenema, O., Wrage, N., Velthof, G.L., Groenigen, J.W., Dolfing, J. and Kuikman, P.J. Trends in global nitrous oxide emissions from animal production systems. *Nutr Cycl. Agroecosyst.*, **72**, 51−56 (2005). DOI: 10.1007/s10705- 004-7354-2.

25. Meda, B., Hassouna, M., Flechard, C., Lecomte, M., Germain, K., Picard, S., Cellier, P. and Robin, P. Housing emissions of NH3, N2O and CH4 and outdoor emissions of CH4 and N2O from organic broilers. In J. Kofer & H. Schobesberger (Eds.), *Proceedings of the XVth International Congress of the International Society for Animal Hygiene,* Tribun, EU. pp. 215−218 (2011).

26. Dolan, A., Ludačkova, J. and Pražma, F. Measurement and evaluation of emission gasses production in the selected poultry farm (in Czech). In Proceedings of the International Scientific Conference: Technology for Agricultural, Municipal and Environmental Technologies, opposed contributions as part of the journal Komunalni Technika, **7**(5): 6. Praha: Profi Press (2013).

27. Fournel, S., Pelletier, F., Godbout, S., Lagace, R. and Feddes, J. Greenhouse gas emissions from three cage layer housing systems. *Animals*, **2**, 1−15 (2012). DOI: 10.3390/ani2010001.

28. Li, H. and Xin, H. Lab-scale assessment of gaseous emissions from laying-hen manure storage as affected by physical and environmental factors. *T. ASABE.,* **53**: 593–604 (2010). DOI: 10.13031/2013.29574.

29. Lyngbye, M. The first air cleaner for poultry with 80% ammonia reduction. *Intern. Poult. Product.,* **21**(7):27−28(2013). http://www.positiveaction. info/pdfs/articles/pp21.7p27.pdf

30. Corkery, G., Ward, S., Kenny, C. and Hemmingway, P. Incorporating smart sensing technologies into the poultry industry. *J World's Poult. Res.,* **3**(4), 106−128 (2013). http://jwpr.science-line.com/

31. Liu, Z., Powers, W., Karcher, D., Angel, R. and Applegate, T.J. Effect of Amino Acid Formulation and Supplementation on Nutrient Mass Balance in Turkeys. *Poult. Sci.,* **90**, 1153−1161(2011). DOI: 10.3382/ps.2010-01082.

32. Čermak, B., Hnisova, J., Petraškova, E., Šoch, M., Kadlec, J., Lad, F. and Vostoupal, B. The influence of the different levels of crude proteins in feed mixture for pigs and poultry and biopolym adition to concentrate for farm building microclimate. Scientific Papers*: Anim. Sci. Biotech.,* **43**(1), 26−28 (2010). https://www.usab-tm.ro/fileadmin/ fzb/Simp%202010/vol1/ANIMAL_FEEDING_A.

33. Li, H., Xin, H., Liang, Y. and Burns, R.T. Reduction of ammonia emissions from stored laying hen manure through topical application of zeolite, Al+ Clear, Ferix-3, or poultry litter treatment. *J. Appl. Poult. Res.*, **17**: 421–431 (2008). DOI: 10.3382/ japr.2007-00076.

34. Gillman, G.P. Converting feedlot waste to fertilizer using charged clays: environmental and economic benefits. Environ. *Qual. Manag.,* **16**, 73–80 (2006).

35. Mohammed, A.N. and ElBably, M.A. Mitigation of Air Gas Emission, and Litter Microbial Quality in Muscovy Duck Pens: The Effectiveness of adding Clinoptilolite Zeolite as a Litter Amendment. *J. Adv. Vet. Res*., **10** (4): 219−225 (2020). https:// advetresearch.com/index.php/AVR/article/ view/550.

تأثير انبعاثات غازات الاحتباس الحراري الضارة داخل نظام الدجاج اللاحم على صحتها : "خيارات الوقاية والمكافحة"

أسماء نادى محمد * [١] ، أمير عبد الباقي[٢] ، إسلام أشرف[٢] ، مصطفى حمدي[٢] ، أحمد حلمي[٢] ، مينا محروس[٢] ، محمد انور[٢] ، محمد خالد[٢] ، محمد عبد الحسيب[٢] ، محمود مصطفى[٢] ، محمد فتح الباب[٢] ، يوسف فايز[٢] ، محمد حسن[٢] ، محمد فؤاد[٢] ، محمد عبد الله[٢]

[١] قسم الصحة والأمراض المشتركة والوبائيات - كلية الطب البيطري - جامعة بني سويف - بني سويف ٦٢٥١١ - مصر
[٢] طلاب الفرقة الخامسة - كلية الطب البيطري - جامعة بني سويف - بني سويف ٦٢٥١١ - مصر

واحدة من المشاكل الرئيسية لتلوث الهواء (GHG) تعد في الوقت الحاضر غازات الاحتباس الحراري المنبعثة التي تهدد مجال الطب البيطري. لذا تهدف الدراسة الى مناقشة التأثير السلبي لغازات الاحتباس الحراري المنبعثة من مزارع الدواجن اللاحم ومدى تأثيرها على صحة كلا من الدجاج والعاملين بالمزارع. أن هناك عدة عوامل تؤثر على معدل انبعاث تلك الغازات ومنها نوع النظام الغذائي وكفاءة معدل التحويل ، وممارسات إدارة السماد وثاني (CH_4) الطبيعي ، والبيئة المحيطة. لقد تم توضيح التأثير الضار لغازات الاحتباس الحراري مثل الميثان على إنتاج المزارع المختلفة ، والحالة الصحية للقائمين (N_2O) وغازات أكسيد النيتروز (CO_2) أكسيد الكربون عليها خلال تلك الدراسة إلى جانب المخاطر التي تنتج عن المستويات المختلفة من التعرض. وتسليط الضوء على الأسباب والمصادر الأساسية لتلك الغازات. استنتجت الدراسة الى أن الطرق الأكثر نشاطًا لمنع ومكافحة غازات الاحتباس الحراري هي خفض معدل الكثافة بعنابر الدواجن ، وتحسين معدل التهوية ، والتخلص الامن من المخلفات الناتجة اثناء دورة التربية ، تحسين الفرشة ، المعالجة الغذائية ، وضع نظام صرف مناسب داخل المزارع والتي لها تأثير واضح على تخفيف انبعاثات غازات الاحتباس الحراري الضارة وتقليل التأثير السلبى لتلك الغازات المنبعثة على صحة الدواجن وكذلك العاملين على مستوى المزارع.

الكلمات مفتاحية: غازات الاحتباس الحراري ، ثاني أكسيد الكربون ، الميثان ، أكسيد النيتروز ، صحة الدواجن، طرق التحكم والسيطرة.