Cairo University
Faculty of Veterinary Medicine
Department of Veterinary Hygiene and Management

Virucidal Ability of Some Disinfectants Against Locally Isolated Avian Viruses in Egypt

Thesis
Presented by:

Abd Elrahman Mohammed Gamal
(B.V.Sc., Faculty of Vet. Med, Cairo Uni., 2010)
(M.V.Sc., Faculty of Vet. Med, Cairo Uni., 2014)

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Animal, Poultry and Environment Hygiene

Under the Supervision of:

Prof. Dr. Osama Zahran
Emeritus Professor of Animal, Poultry and Environmental Hygiene.
Department of Veterinary Hygiene
Faculty of Veterinary Medicine
Cairo University.

Prof. Dr. Mohamed Mohamed Ali
Professor of Animal, Poultry and Environmental Hygiene.
Department of Veterinary Hygiene
Faculty of Veterinary Medicine
Cairo University.

Prof. Dr. Sherif Tawfik Moubarak
Professor of Animal, Poultry and Environmental Hygiene
Department of Veterinary Hygiene
Faculty of Veterinary Medicine
Cairo University.

Dr. Elshaimaa Ismael Sayed Solayman
Lecture of Animal, Poultry and Environmental Hygiene.
Department of Veterinary Hygiene
Faculty of Veterinary Medicine
Cairo University.

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This is to approve that the dissertation presented by Abdelrhman Mohamed gamal to Cairo university for the degree of Ph.D. (Animal, Poultry and Environmental Hygiene) has approved by the examining committee.

1. Prof. Dr. Ahmed Mohamed Byomi Professor of Animal, Poultry and Environmental Hygiene Faculty of Veterinary Medicine University of Sadat City and the Head of Sadat City University.	Ahmed M. Byomi
2. Prof. Dr. Hassan Moustafa El-Agrab Professor of Animal, Poultry and Environmental Hygiene Faculty of Veterinary Medicine Cairo University.	
3. Prof. Dr. Osama Mohamed Kamel Zahran Professor of Animal, Poultry and Environmental Hygiene Faculty of Veterinary Medicine Cairo University.	
4. Prof. Dr. Mohamed Mohamed Ali Professor of Animal, Poultry and Environmental Hygiene Faculty of Veterinary Medicine Cairo University.	Dr. Mohamed Ali
5. Prof. Dr. Sherif Tawfik Moubarak Professor of Animal, Poultry and Environmental Hygiene Faculty of Veterinary Medicine Cairo University.	S.T. Moubarak

(2018)

Supervision sheet

This thesis is under supervision of:

Prof. Dr. Osama Mohamed Kamel Zahran

Emeritus Professor of Animal, Poultry and Environmental Hygiene- Faculty of Veterinary Medicine- Cairo University

Prof. Dr. Mohamed Mohamed Ali
Professor of Animal, Poultry and Environmental Hygiene- Faculty of Veterinary Medicine- Cairo University

Prof. Dr. Sherif Tawfik Moubarak

Professor of Animal, Poultry and Environmental Hygiene- Faculty of Veterinary Medicine- Cairo University

Dr. Elshaimaa Ismael Sayed Solayman

lecturer of Animal, Poultry and Environmental Hygiene- Faculty of Veterinary Medicine- Cairo University.

Cairo University
Faculty of Veterinary Medicine
Department of Veterinary Hygiene and Management

- **Name:** Abd Elrahman Mohammed Gamal
- **Nationality:** Egyptian
- **Date of birth:** 15 / 7 / 1988
- **Specialization:** Animal, poultry and environmental hygiene
- **Title of thesis** Virucidal Ability of Some Disinfectants Against Locally Isolated Avian Viruses in Egypt

Supervisors:

Prof. Dr. Osama Mohamed Kamel Zahran

Emeritus Professor of Animal, Poultry and Environmental Hygiene - Faculty of Veterinary Medicine - Cairo University.

Prof. Dr. Mohamed Mohamed Ali

Professor of Animal, Poultry and Environmental Hygiene-Faculty of Veterinary Medicine - Cairo University.

Prof. Dr. Sherif Tawfik Moubarak

Professor of Animal, Poultry and Environmental Hygiene - Faculty of Veterinary Medicine - Cairo University.

Dr. Elshaimaa Ismael Sayed Solayman

lecturer of Animal, Poultry and Environmental Hygiene- Faculty of Veterinary Medicine - Cairo University.

Abstract:

This study was carried out to help improving two of the most important pillars of any biosecurity programs, Disinfection and Footbath. The aim of this study was to evaluate the viricidal ability of fourteen commonly used and commercially available disinfectants on poultry farms against velogenic Newcastle disease virus (NDV), Low Pathogenic Avian

Influenza Virus (LPAI) H9N2 that were isolated locally in Egypt. To simulate the Egyptian field conditions, we used two different surfaces (cement and rubber) contaminated experimentally with the previously mentioned viruses, we also added two interfering materials together, organic matter and hard water. Against NDV our results revealed that three disinfectants out of fourteen were able to pass the test criteria (achieving at least 2.8 log reductions, and no recoverable viruses were isolated after the treatment) these disinfectants were calcium hypochlorite, Halamid® and ZixVirox® while Virkon S®, PIQuat 20®, Aquazix E52®, Fumagri Effisafe® GroundZero ®, Synergize®, Formic, and Citric acid, all failed to pass the test criteria (either not achieving the required log reduction or stopping the viral propagation). Against (LPAI) H9N2 or results revealed that most of the used disinfectants were effective in destroying the virus after the treatment as disinfectants (VirkonS®, Halamid®, Ca.Hypochlorite, PIQuat20®, Aquazix E52®, Zixvirox®, Dyne-O-Might® and Fumagri Effisafe®) were all able to achieve the previously mentioned test criteria. While disinfectants (Synergize®, Groundzero®, Iodis® formic and citric acid) all failed to pass the test criteria. The study was also done to evaluate disinfectants suitability to the footbath task, for this purpose we used disinfectants that commonly used in the Egyptian poultry farms in footbath. Different forms of disinfectants were used (liquid, solid and semisolid). We had concluded after this experiment that aldehydes, iodophors, phenols and powder form disinfectants (VirkonS®+ salt, Halamid®+ calcium carbonate, paraformaldehyde+ calcium carbonate, and Ca.Hypochlorite + calcium hydroxide) were the most effective in the footbath, on the other hand the semisolid form of the tested disinfectants gave variable results in the footbath.

Key words: Viricidal – Chemical disinfectant – Avian influenza virus – New castle disease virus - Inactivation – Footbath- Biosecurity – Egypt.

Dedication

I would like to dedicate this work to My Teacher, My Wife Asma, Daughter Aliyah, and My family, I hope I made you happy.

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LIST OF ABBREVIATIONS:

AI	Avian Influenza
AusVetPlan	Australian Veterinary Emergency Plan
DVG	Deutsche Veterinärmedizinische Gesellschaft
DVV	German Association for the Control of Virus Disease
ECEs	Embryonated Chicken Eggs
EID50	Mean Embryo Infective Dose
EMA	European-Middle Eastern-African
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
HA	Haemagglutination
HA	Haemagglutinin
HI	Haemagglutination Inhibition
HPAIV	Highly Pathogenic Avian Influenza Virus
LPAIV	Low Pathogenic Avian Influenza Virus
NDV	Newcastle disease virus
OIE	World Organisation for Animal Health
PBS	Phosphate Buffer Saline
PCR	Polymerase Chain Reaction
RT-PCR	Reverse Transcriptase-Polymerase Chain Reaction
SPF	Specific Pathogen Free
WHO	World Health Organization
TCID	Tissue Culture Infective Dose
ASTM	American Society for Testing and Materials
AFNOR	Association Francaise de Normalisation

Introduction:

In Egypt the rapidly growing sector of poultry farming, plays an important role in the Egyptian food security chain. The sustainability of this sector is continuously threatened by emergence of different viral pathogens e.g. Newcastle disease virus and avian influenza virus. These viruses can hypothetically be transmitted to chickens via contaminated inanimate surfaces. Many of these viruses exhibit long-lasting stability on surfaces, especially when organic matter is present. Newcastle disease virus (NDV) was first identified in Egypt in 1948 **(Daubney and Mansy 1948).** The disease spread widely throughout the country and has been recorded as an "endemic" at the beginning of 1960s. **(El-Nassary and Eskarous, 1960)**. Trials for controlling the disease were practised by mass vaccination programs using combined live attenuated and inactivated vaccines to develop solid immunity against the virus. **(Alexander, 2000, Ewies et al., 2017)**. Since the early months of 2011, many NDV outbreaks with high mortality rates have been recorded regardless the adopted intensive vaccination programs, these outbreaks were attributed to the circulation of the new genotype VIId that wasn't reported before in Egypt. **(Radwan et al., 2013, Ewies et al., 2017)**. The first report of Low pathogenic avian influenza H9N2 infection in Egypt was in November 2011, when the virus was