



Cairo University
Faculty of Veterinary Medicine

Title

Investigating the significance of nucleotides dietary fortification in broiler diet to cope with the different stressors

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بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم "

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Abstract

To study the effects of exogenous dietary nucleotides supplementation on broiler performance, gut health parameters, and immunity. Two separate experiments were performed. The first experiment, 270 one-day-old mixed broiler chicks (Cobb 500) randomly divided into 6 treatment groups with 3 replicates of 15 chicks each. Treatment 1 (CX), a negative control group fed corn-soybean basal diet without added nucleotides. Treatment 2 (CN 0.05) and treatment 3 (CN 0.1), consisted of chicks fed a basal diet with the addition of nucleotides on top at two levels (0.05 and 0.1 %) respectively. Treatment 4 (PX), treatment 5 (PN 0.05), and treatment 6 (PN 0.1) consisted of chicks that were challenged with *C. perfringens* inoculum ($\sim 4 \times 10^8$ CFU/ml) on d 14, 15, 16 and 17 of the experiment and fed diets similar to treatments 1, 2, and 3 respectively. The trial continued for 35 days. The second experiment, a total of 315 one-day-old mixed broiler chicks (Cobb 500) were randomly assigned to 6 treatment groups with 3 replicates (the number of chick/ replicate differ according the required stocking density). A 2×3 factorial design with two stocking densities ($0.073 \text{ m}^2/ 2.2 \text{ kg bird}$ and $0.05 \text{ m}^2/ 2.2 \text{ kg bird}$) and 3 levels of dietary NP (0, 0.05, 0.1 %) was used in this trial. The trial continued for 35 days. Obtained results showed that dietary nucleotide supplementation markedly ameliorates the negative effects of stressful condition (such as *C. perfringens* infection or high stocking density) by improving the intestinal barrier functions, intestinal histomorphology, digestive enzymes production, and immune status of bird, which directly reflected on growth performance of affected birds.

Key words: Nucleotides, *Clostridium perfringens*, high stocking density, lesion score, intestinal barriers, digestive enzyme, growth performance, gut health parameters, and immunity.

Dedication

*I wish to introduce my deep
gratitude and utmost thanks to*

My parents

and

Special thanks to

my wife

for her continuous encouragement

to complete this work.

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*First and foremost, I am greatly indebted in all my work and success to merciful
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List of abbreviations

A	Adenine
ACTH	Adrenocorticotrophic hormone
AGPs	Antibiotic growth promoters
ALP	Alkaline phosphates
AMP	Adenosine monophosphate
AOAC	Association of Official Analytical Chemists
AP	Alkaline phosphatase
ATP	Adenosine triphosphate
BW	Body weight
BWG	Body weight gain
C	Cytosine
<i>C. perfringens</i>	<i>Clostridium perfringens</i>
Ca.	Calcium
cAMP	Adenosine 3'', 5''-cyclic phosphate
CF	Crude fiber
CFU	Colony forming unit
Cl	Chloride
Cm	Centimeter
Cm ²	Square centimeter
CMP	Cytidine monophosphate
Co	Cobalt
CoA	Co-enzyme A
CP	<i>Clostridium perfringens</i>
CPE	<i>Clostridium perfringens</i> enterotoxin
CS	Corticosteron
Cu	Copper
CU- IACUC	Cairo University Institutional Animal Care and Use Committee
D	Day
dAMP	2'-deoxyadenosine 5'-monophosphate
dCMP	2'-deoxycytosine 5'-monophosphate
dGMP	2'-deoxyguanosine 5'-monophosphate
DNA	Deoxyribonucleic acid
EE	Ether extract
EU	European Community
FAD	Flavin adenine dinucleotide
FCR	Feed conversion ratio
Fe	Iron
FI	Feed intake
G	Guanine
GIT	Gastrointestinal tract
H	Hydrogen atom
HA	Haemagglutination

HI	Haemagglutination inhibition
HPA axis	Hypothalamic–pituitary–adrenal axis
HSD	High stocking density
HZ	Hertz
IBV	Infectious Bursal Disease
IgA	Immunoglobulin A
IgG	Immunoglobulin G
IL-1	Inteleukin-1
IL-2	Inteleukin-2
IL-4	Inteleukin-4
Ile	Isoleucine
IMP	Inosine monophosphate
INF- γ	Interferon- gamma
Kcal	Kilocalorie
kDa	kilodalton
Kg	Kilogram
LPS	Lipopolysaccharides
LSD	Low stocking density
Lys	Lysine
m ²	Sequar meter
MCP	Mono-calcium phosphate
ME	Metabolizable energy
Met	Methionine
Mg	Magnesium
mg/kg	Miligram per kilogram
mm ²	Square millimeter
Mn	Manganese
mRNA	Messenger RNA
MUC	Mucin
MUC2	Mucin2
N	Nitrogen
Na	Sodium
NAD	Nicotinamide adenine dinucleotide
NADP	Nicotinamide adenine dinucleotide phosphate
NC	Negative control
NDV	Newcastle Disease Virus
NE	Necrotic enteritis
NetB	Necrotic enteritis B-like toxin
NO	Nitric oxide
NP	Nucleoforce Poultry®
NT	Nucleotide
O	Oxygen atom
P	Phosphorus
PBS	Phosphate buffer saline
PCR	polymerase chain reaction

Pmol	Picomole
Ppm	Part per million
PROT	Protein
PUFA	long-chain polyunsaturated fatty acids
RNA	Ribonucleic acid
SBM	Soybean meal
SCP	single cell proteins
Se	Selenium
SEM	Standard error
Sod. Chloride	Sodium chloride
Sod.Bicarb.	Sodium bicarbonate
Spp	Species
T	Thymidine
Th1	T-helper cell 1
Th2	T-helper cell 2
Thr.	Threonine
TJs	Tissue Junctions
U	Uracil
UDP	Uridine diphosphate
UDP-glucose	Uridine diphosphate glucose
V/C	Villus length/crypt depth
YCW	Yeast cell wall
Zn	Zink
ZO	Zonula occludens
ZO-1	Zonula occludens-1
μL	Microlitre
μmol/L	Micromole per litre