

Recent Trends in poultry production.

An overview .

Dr Jayaraman.

Catalyst techvisors .

Topics of Discussion

1. *Current scenario of poultry production*
2. *Threats , challenges in current productions*
3. *Trends & Alternatives .*
4. *Future research focuses .*

Productivity has improved a lot

1957



1978



2005



Productivity has improved in all segments

Broiler

- FCR 1.6 for 2 kg BW
- Mortality 5%.

Layer

- Egg production 320 eggs

Breeder

- Chicks per dam 145 - 150 .

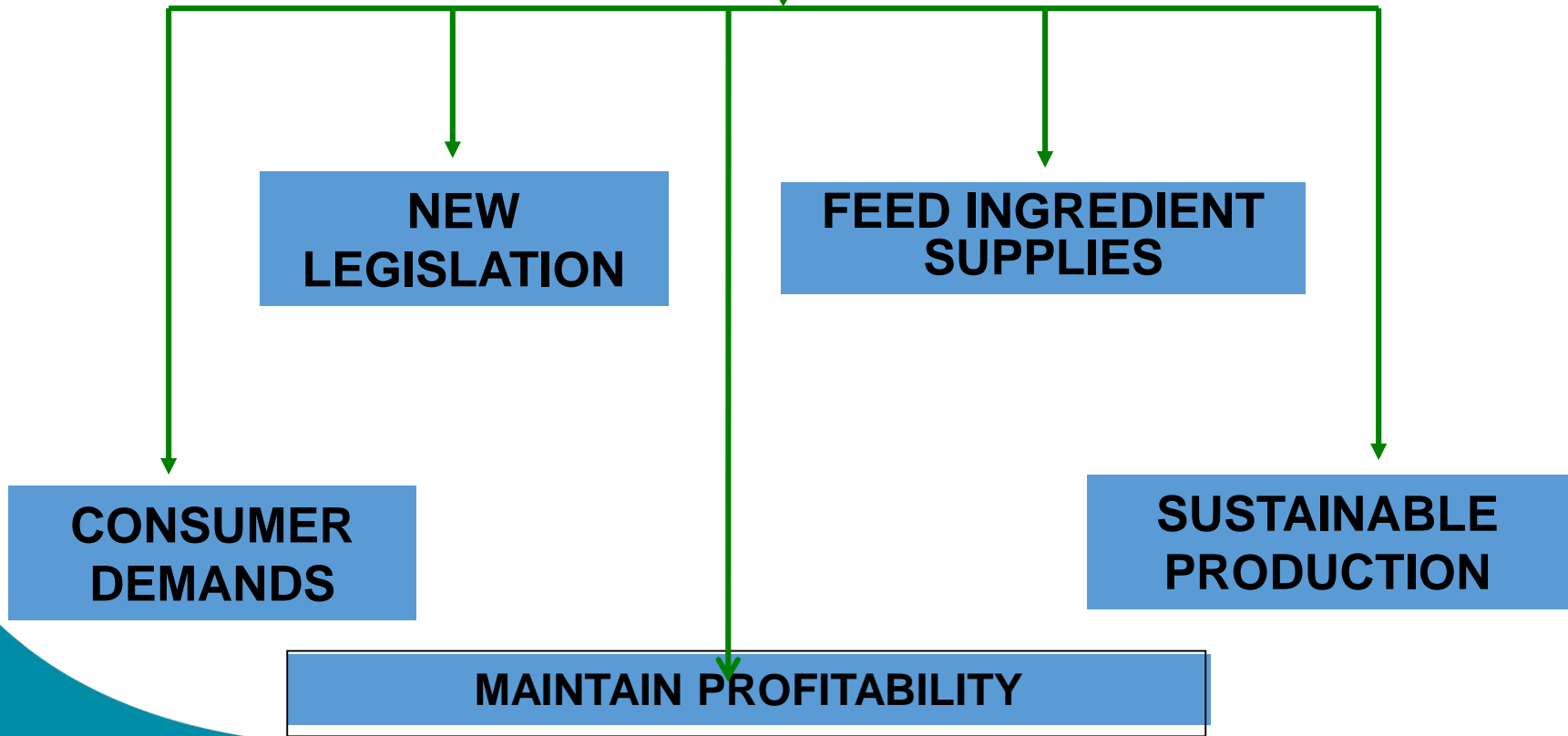
Reasons for better productivity

- Improved Genetics .
- Better Nutrition
- Advanced climate controlled housing systems
- Excellent Disease control
 - Improved Vaccines and vaccination techniques .
 - Effective use of Antibiotics and AGP”S

Rearing systems advanced . Still we do face hurdles



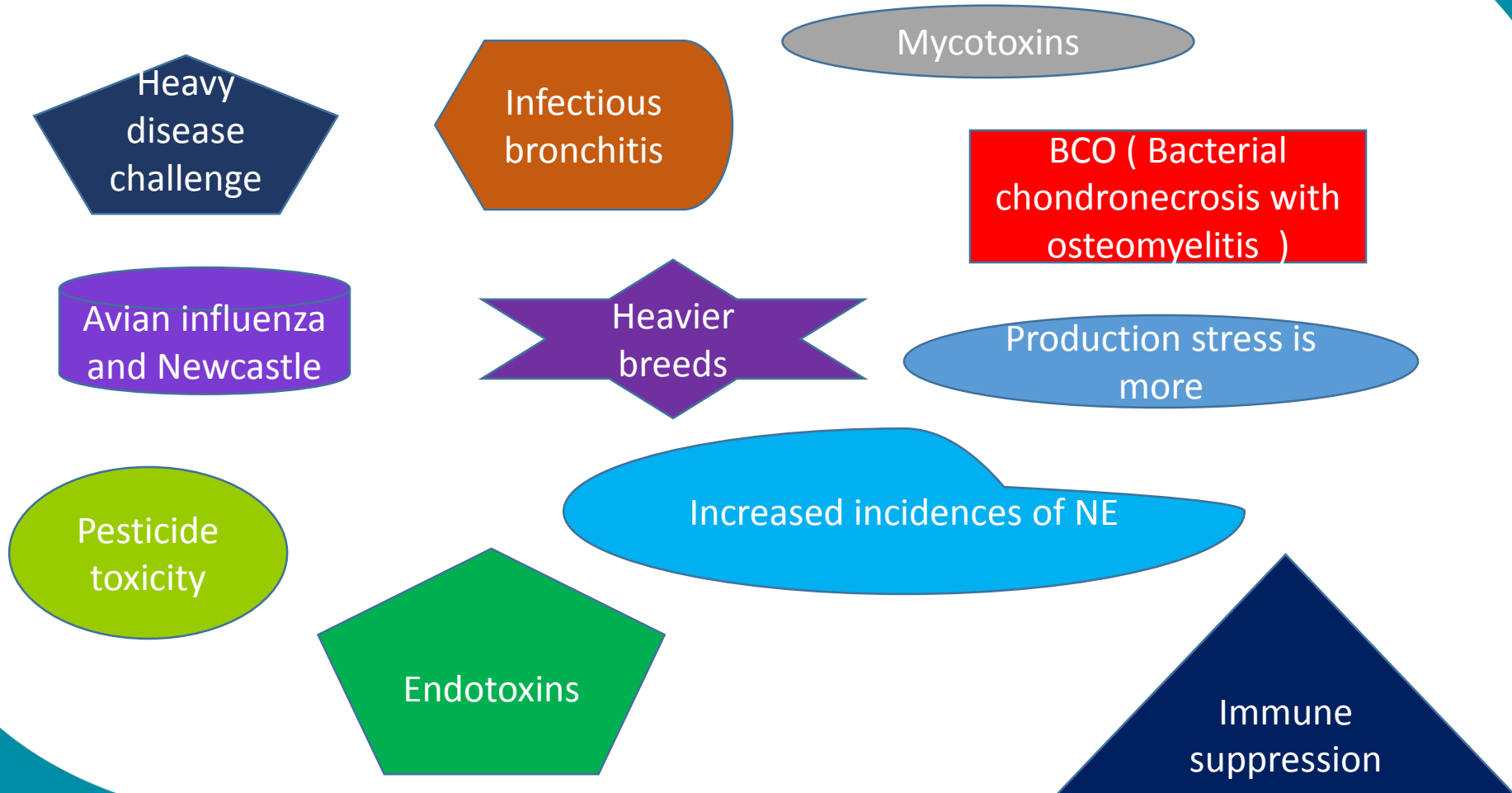
CHALLENGES IN MODERN ANIMAL PROTEIN PRODUCTION



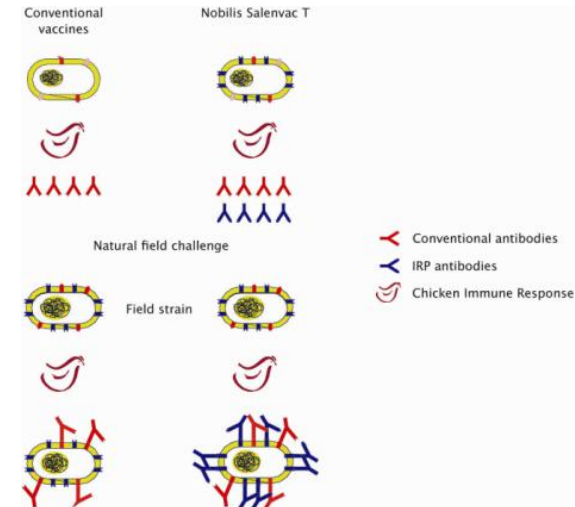
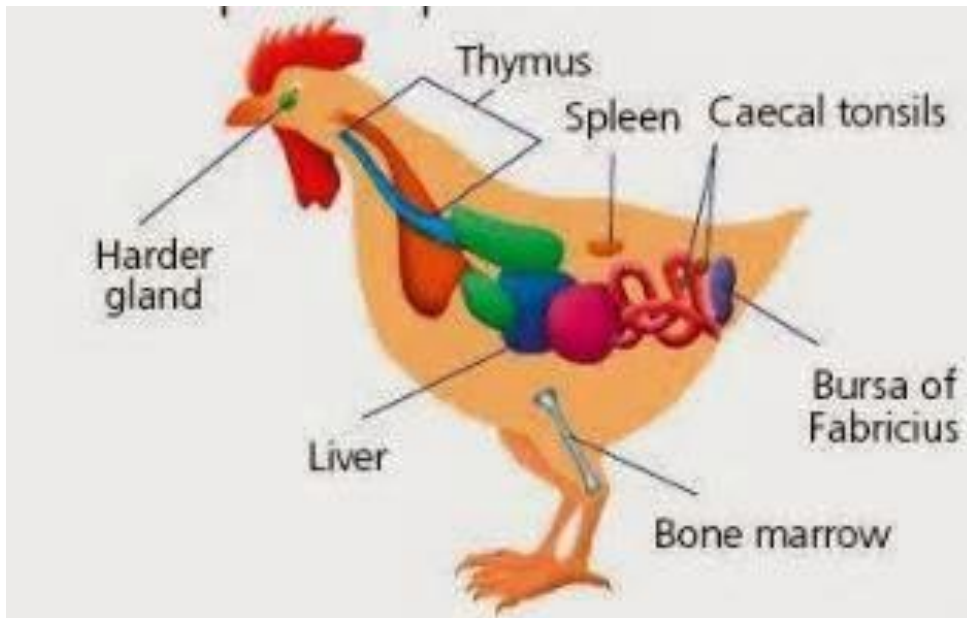
Are we comfortable ?



2. Threats , challenges in current productions



But Don't Miss out onslaught on immunity



2.1.Challenge-pathogenic Bacterial over population and necrotic enteritis

- Bacterial overgrowth and reduced performance .
- From ancient time onwards this is the major threat in broiler production .
- Currently which gains serious attention is Necrotic enteritis

Which Bacterial Disease is more concern ? Economically ?

- Clostridium .,Necrotic enteritis
- In broiler very much .
- In layer and Breeder to some extent .

Necrotic enteritis (NE)

- Faster growth .
- So many unconventional feed raw materials
- Higher un used protein in ceca .
- Subclinical coccidiosis
- Inclusion of higher quantity of Wheat .



NE on Rise !!!!!

- Reasons may be many . But sure it is on rise.
- Growth-promoting antibiotics have been banned from animal feed in the European Union and, worldwide,. **This has contributed to the higher prevalence of economically important diseases such as necrotic enteritis**

(Van Immerseel *et*

al., [2009](#)F., Rood, J.I., Moore, R.J.and Titball, R.W. 2009. Rethinking our understanding of the pathogenesis of necrotic enteritis in broilers. *Trends in*

Meat

Background | Oct 9, 2015 | 13571 views | [4 comments](#)

| update:Mar 9, 2016

The true cost of necrotic enteritis

Necrotic enteritis has increased in occurrence and severity over the years. When it comes to the damage it causes, producers often adopt the figure of US\$0.05 per chick derived from a US\$2 billion loss on a worldwide scale estimated in 2000. Since then, parameters have changed, as have the true costs of NE, which could come close to US\$6 billion in 2015.

For those with an interest in the bacterial pathology of chickens, most, if not all, will be aware of **necrotic enteritis** (NE), a disease found worldwide wherever chickens are farmed. This economically significant disease, caused by the bacterium *Clostridium perfringens*, causes lesions in the chicken's intestine and can lead to flock mortality of 1% per day (clinical NE). The true economic impact of NE though is felt not from those birds that die from infection, but those who suffer from disease but survive subclinical NE.



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2.2 Challenge - Bacterial chondro necrosis with osteomyelitis (BCO)



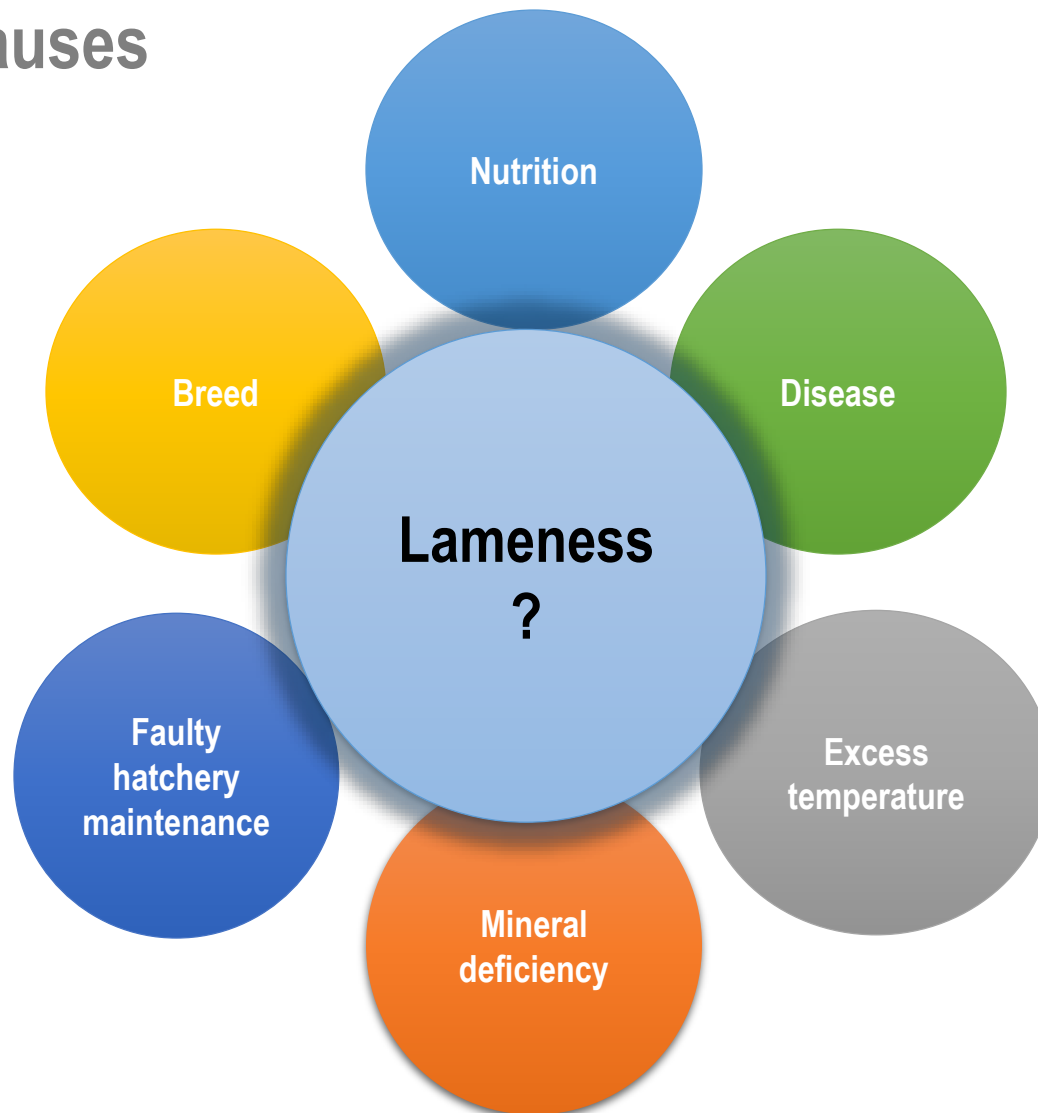
Bacterial chondronecrosis with osteomyelitis

- More and more heavier breeds more and more incidences of BCO"s.
- During liquidation , we could find 0.5 to 0.75 % of birds are left as lameness birds .

-Bacterial chondronecrosis with osteomyelitis ('femoral head necrosis') of broiler chickens: a review.

[McNamee PT](#), [Smyth JA](#).

possible causes





Surprise bacterium linked to lameness in broilers

A bacterium not previously known to affect chickens is now thought to be the cause of lameness in broilers, according to University of Arkansas researchers.[\[1\]](#)

“We have identified *Staphylococcus agnetis* as significantly involved in bacterial chondronecrosis with osteomyelitis (BCO)...” the researchers say.

BCO is one of the most common causes of lameness in commercial broilers. It’s a major economic and welfare concern for poultry producers, but relatively little is known about the microbial communities associated with BCO.[\[2\]](#)

In their study, the researchers raised broilers on wire flooring, which has been known to enhance the development of lameness. Next they tested overtly lame birds for bacteria in BCO lesions and found *S. agnetis* was the predominant genus (Table 1).

Table 1. Bacterial species identified by PCR-sequencing from 24 lame birds based on sampling of the right and left femurs, right and left tibias and blood

Bacterial species	Total found
<i>Enterococcus faecalis</i>	0
<i>Staphylococcus agnetis</i>	81
<i>Staphylococcus aureus</i>	3
<i>Staphylococcus epidermidis</i>	2
<i>Staphylococcus hominis</i>	3
<i>Staphylococcus saprophyticus</i>	1
<i>Staphylococcus xylosus</i>	2

Note: Table adapted from the PLOS ONE article

Leg problems? Your broilers may suffer a gut barrier failure!

 Posted by *PlusVet* on November 2, 2016



By improving gut health, you can cut down the cases of lameness in your farm

2.3 Challenge - *Ornithobacterium rhinotracheale* (ORT)

- Still today ,common belief is that if there is a respiratory problem , it has to be Chronic respiratory disease or IB or Avian meta pneumo virus .
- There is one more added to this list
- From chicken broilers, it was initially isolated during 1993 in South Africa from the birds showing mild respiratory signs .

Over succeeding years, isolations have been reported from numerous geographical regions including Belgium ([DEVRIESE et al., 2001](#)), Brazil ([CANAL et al., 2005](#)), Canada ([JOURBERT et al., 1999](#)), France ([LEROY-SETRIN et al., 1998](#)), Germany ([HAFEZ and STING, 1996](#)), Israel ([BOCK et al., 1997](#)), Japan ([SAKAI et al., 2000](#)), Mexico ([SORIANO VARGAS et al., 2002](#)), the Netherlands ([VAN EMPEL et al., 1997](#); [VAN VEEN et al., 2000](#)), South Africa ([TRAVERS, 1996](#)), the UK ([VAN EMPEL et al., 1997](#)) and USA ([ODOR et al., 1997](#)).

ORT might have probably been present in poultry flocks for many years but due to difficult isolation and identification it might have been missed.



Arch.Geflügelk., **72** (5). S. 202- 206 , 2008, ISSN 0003-9098. © Verlag Eugen Ulmer, Stuttgart

Outbreak of *Ornithobacterium rhinotracheale* (ORT) infection in chickens in Pakistan

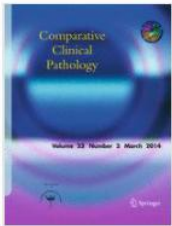
Ausbrüche von *Ornithobacterium rhinotracheale* (ORT) Infektionen bei Hühnern in Pakistan

M. Siddique ¹, T. Zia ² and S. U. Rehman ¹

✉ profdrmsiddiqueuaf@hotmail.com

¹Department of Veterinary Microbiology, University of Agriculture, Faisalabad, Pakistan

²Remount Veterinary Farms Corps



[Comparative Clinical Pathology](#)

March 2014, Volume 23, [Issue 2](#), pp 415–418

Serologic prevalence of *Ornithobacterium rhinotracheale* infections in broilers and broiler breeder chickens in Kermanshah Province, west of Iran

Authors

[Authors and affiliations](#)

commercial kit. The results revealed that 50.1 % broiler and 70.5 % broiler breeder chickens were serologically positive for ORT. Out of 347 serum samples obtained from broiler chickens, 174 (50.1 %) were positive for ORT antibodies, which represented 18 (75.0 %) of 24 examined broiler flocks. A higher rate of seropositivity (71.4 % of samples and 83.3 % of broiler flocks)

DOI: 10.2298/AVB1203313G

UDK 636.5:579.62:616-091:616.24-008.4

**EXAMINATION OF ORNITHOBACTERIUM RHINOTRACHEALE PRESENCE AND
PATHOMORPHOLOGICAL CHANGES IN BROILER RESPIRATORY ORGANS IN INTENSIVE
BROILER PRODUCTION**

GAVRILOVIĆ P*, JOVANOVIĆ M** and ŽIVULJ A*

**Veterinary Specialized Institute "Pančevo", Pančevo, Serbia*

***University of Belgrade, Faculty of Veterinary Medicine, Serbia*

(Received 6th September 2011)

*Three flocks of broilers from the epizootiological region of South Banat, Serbia were chosen for examination, one flock with manifestation of respiratory disorders and two control flocks without respiratory disorders. In the flock with manifested respiratory disorders which was marked as flock number one (flock 1), high seroprevalence of specific antibodies for *O. rhinotracheale* (46%) was found in 30-day-old broiler chickens. The symptoms presented were: depression, reduction in feed consumption and water intake, sneezing, mucosal nasal discharge and facial edema. Production results were below technological standards due to increased mortality, decreased growth range and increased number of stunted chickens. Autopsy found frequent changes in the trachea, air sacs and lungs, which were manifested as: tracheitis catarrhalis, aerosacculitis fibrinosa and pneumonia fibrinosa.*

RESEARCH ARTICLE | OPEN ACCESS

Co-infection of broilers with *Ornithobacterium rhinotracheale* and H9N2 avian influenza virus

Qing Pan, Aijing Liu, Faming Zhang, Yong Ling, Changbo Ou, Na Hou and Cheng He 

BMC Veterinary Research 2012 8:104 | <https://doi.org/10.1186/1746-6148-8-104> | © Pan et al.; licensee BioMed Central Ltd. 2012

Received: 8 November 2011 | Accepted: 2 July 2012 | Published: 2 July 2012

Abstract

Background

Since 2008, a progressive pneumonia has become prevalent in broilers and laying hens. This disease occurs the first day after hatching and lasts more than 30 days, resulting in approximately 70% morbidity and 30% mortality in broilers. The objective of this study was to isolate and identify the pathogens that are responsible for the progressive pneumonia and establish an animal model for drug screening.

Results

Avian Diseases

Published by: **American Association of Avian Pathologists**

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Avian Diseases 51(3):777-780. 2007
[https://doi.org/10.1637/0005-2086\(2007\)51\[777:SAIOOR\]2.0.CO;2](https://doi.org/10.1637/0005-2086(2007)51[777:SAIOOR]2.0.CO;2)

Seroprevalence and Identification of *Ornithobacterium rhinotracheale* from Broiler and Broiler Breeder Flocks in Thailand

[Niwat Chansirpornchai](#), [Wisanu Wanasawaeng](#), [Jiroj Sasipreeyajan](#)

American Association of Avian Pathologists

Received: October 9, 2006; **Accepted:** March 21, 2007

[\[+\] Author & Article Info](#)

Abstract

Ornithobacteriosis is an infectious disease of avian species that has been reported in almost all countries around the world, except Thailand. The objectives of this study were to determine the seroprevalence of *Ornithobacterium rhinotracheale* (ORT) and to isolate and identify ORT in broilers and broiler breeders in Thailand. Chicken antibodies had been randomly checked from 17 farms (19 flocks) of broilers and 23 farms (28 flocks) of broiler breeders. The seropositive flocks were 63% and 100% in broilers and broiler breeders, respectively. The sera analysis showed that the individual 280 broiler sera antibody responses were 67.5% negative, 12.9% suspect, and



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Histopathologic and Myogenic Gene Expression Changes Associated with Wooden Breast in Broiler Breast Muscles

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Kidney Cell-Adapted Infectious Bronchitis ArkDPI Vaccine is Stable and Protective

More

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Review of Infectious Bronchitis Virus

Avian Diseases 56(2):365-368. 2012
<https://doi.org/10.1637/9903-082311-Reg.1>

Improved Broiler Performance Associated with *Ornithobacterium rhinotracheale* Vaccination in Breeders

[Peter De Herdt](#), [Marlies Broeckx](#), [Wouter Vankeirsbilck](#), [Geert Van Den Abeele](#) and [Stefaan Van Gorp](#)

American Association of Avian Pathologists

Received: August 24, 2011; **Accepted:** January 10, 2012

[\[+\] Author & Article Info](#)

SUMMARY.

During a field study in 2010 the daily growth, feed conversion, first-week mortality, broiler loss due to mortality and slaughterhouse condemnation, and production index were monitored in 100 broiler flocks derived from four breeder farms vaccinated with Nobilis OR inac and four *Ornithobacterium rhinotracheale*-unvaccinated breeder farms of the same organization in Belgium. Other parameters related to the broiler flocks, such as flock size, season, age of the breeders, and corresponding breeder farms, were also noted. All gathered data were examined with ANOVA, linear correlation, and linear regression analyses. Results demonstrated a significant 22.3% lower broiler loss and a significant 3.9% higher production index in the broiler flocks derived from breeders vaccinated with Nobilis OR inac. These results confirm field observations obtained in 1999, thereby providing further evidence for an effect of *O. rhinotracheale* vaccination in breeders with regard to the improved performance of broilers.

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Abstract & References

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Citing Articles

2.4 Challenge - Endotoxins

 Feed additives

Background | 17 Oct 2016 | 2318 views | [1 comment](#)



Endotoxins – A constant threat

Endotoxins are present everywhere in the environment: in the air, the water, soil and in the gastrointestinal tract of animals. Protecting all livestock from their toxic effects should be a priority for everyone from feed to farm.



Search the web and Windows



Endotoxins

Endotoxins, also known as lipopolysaccharides (LPS), are part of the outer membrane of the cell wall of all gram-negative bacteria (e.g. *E. coli*, *Salmonella*, *Shigella*, *Pseudomonas*, among others) that are released from bacterial cell wall by shedding or through bacterial lysis.

EXO and ENDOTOXINS.

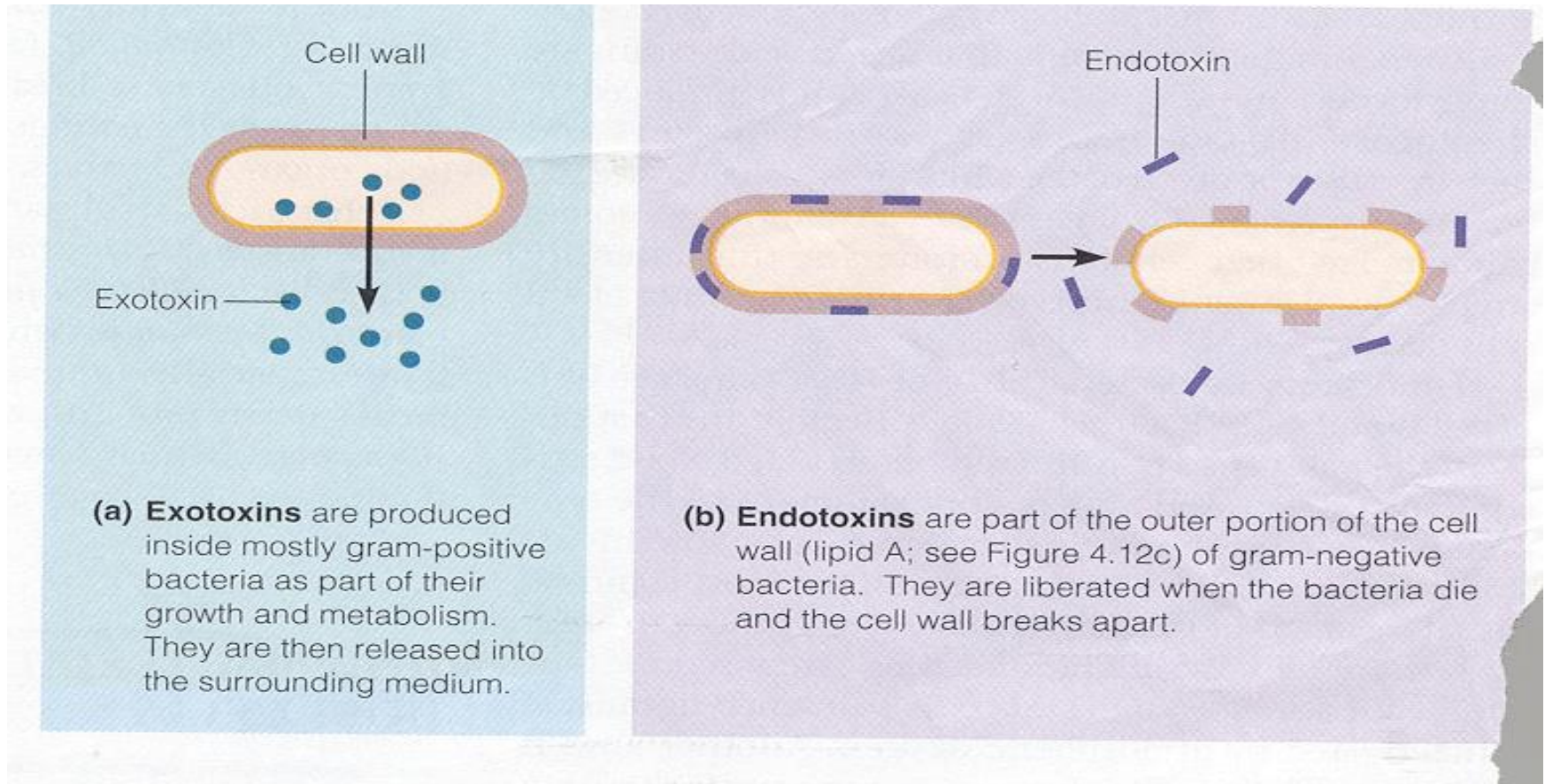
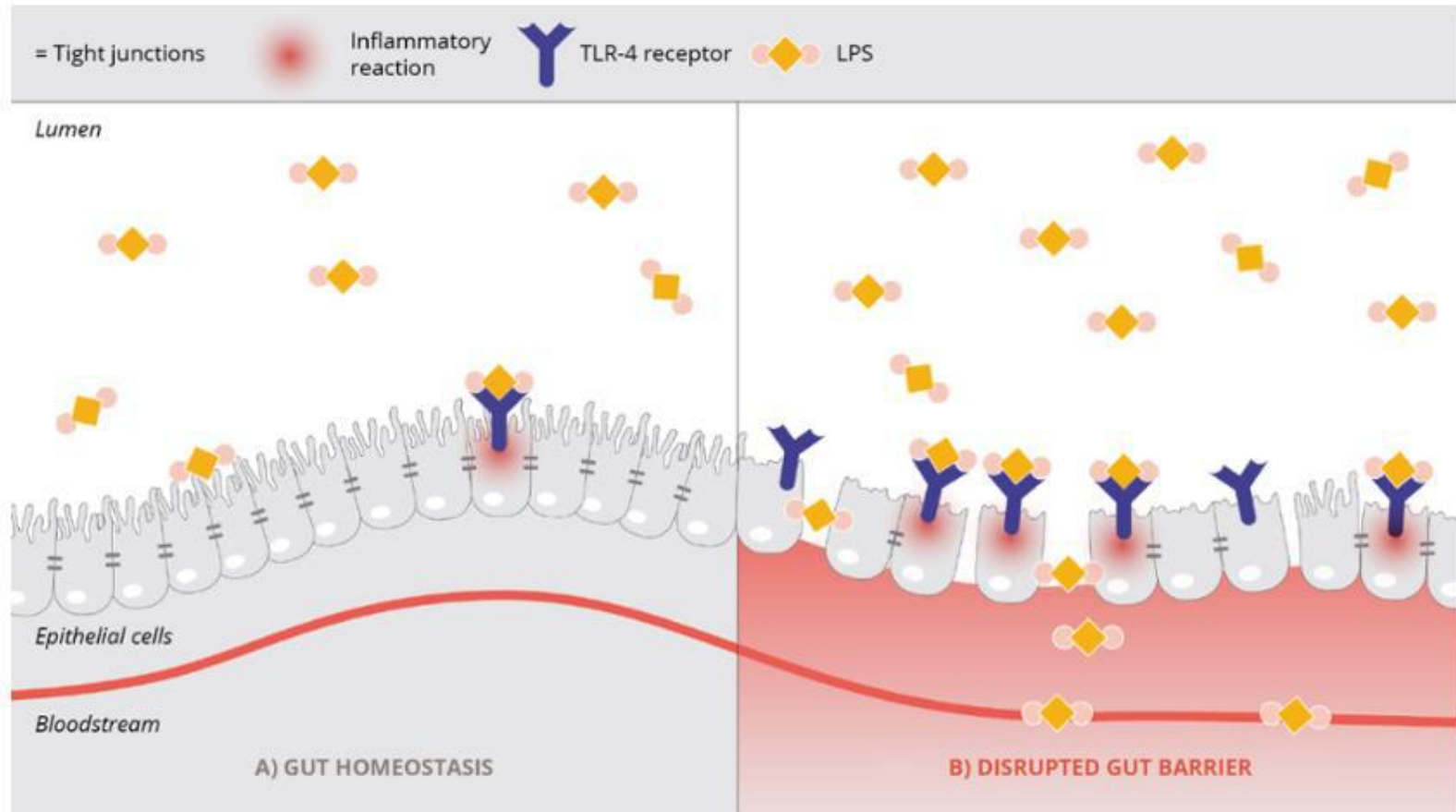


Figure 2 - Transfer of endotoxins from the lumen into the bloodstream.



Environment and endotoxin exposure

While the main route for lipopolysaccharide exposure in poultry is the gastrointestinal tract, the concentration of endotoxins in the air and dust should not be overlooked - endotoxins are a major component of biological dust.

2.5 Challenge – Pesticide Toxicity

- An emerging menace in certain countries .
- All species of poultry are affected .
- Breeder and layers and broilers .
- No exemption

Examples



Organochlorines

- DDT
- Aldrin
- Dieldrin
- Endosulfan
- Gamma HCH
- Gamma BHC



Carbamates

- Aldicarb
- Carbofuran

Pyrethroids

- Tefluthrin
- Deltamethrin
- Lambda
- cyhalothrin
- Permethrin
- Cypermethrin



Organophosphates

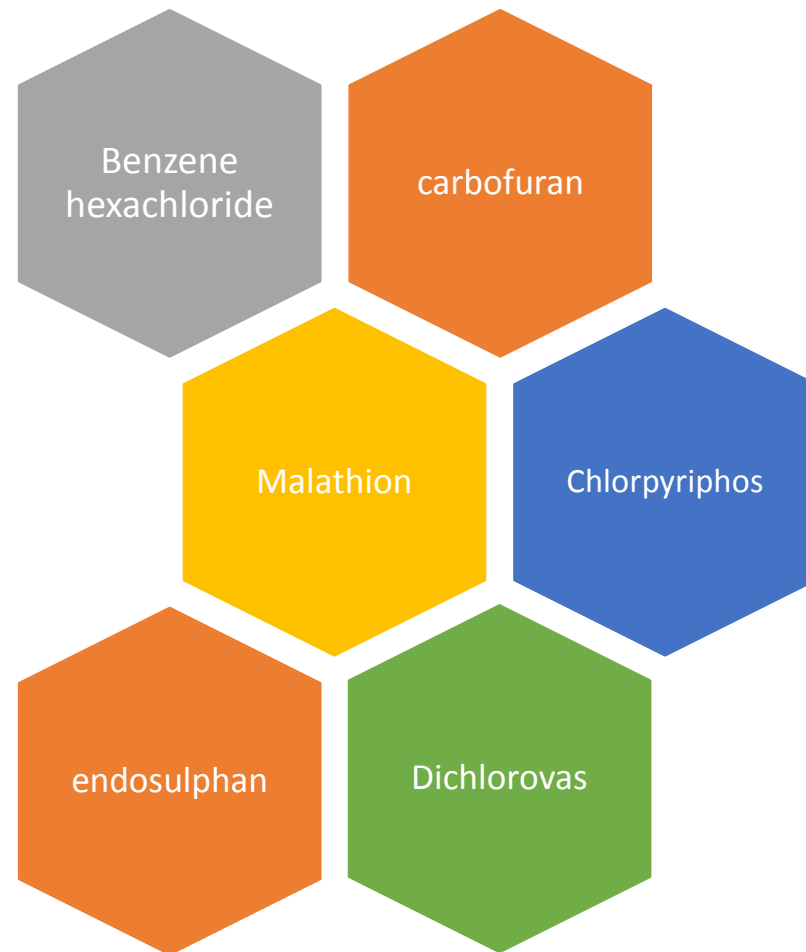
- Diazinon
- Fenitrothion
- Dichlorvos
- Dimethoate
- Malathion

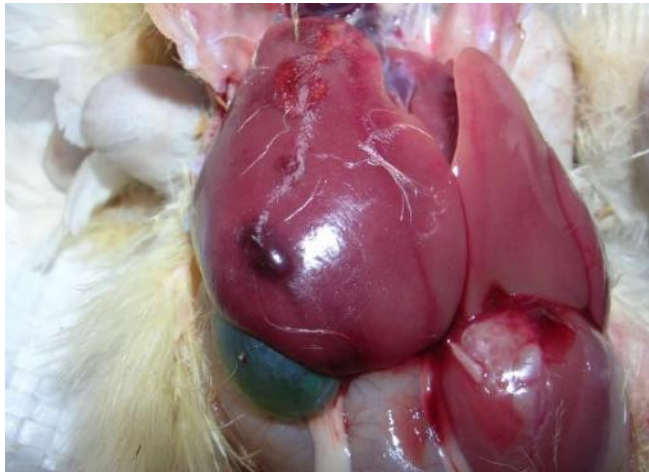


Neonicotinoids

- imidacloprid
- nitenpyram
- acetamiprid
- thiamethoxam

Common insecticides





Submitted: 26/11/2010

Accepted: 30/12/2010

Published: 25/02/2011

Chlorpyrifos chronic toxicity in broilers and effect of vitamin C

A.M. Kammon^{1,*}, R.S. Brar², S. Sodhi², H.S. Banga², J. Singh³ and N.S. Nagra⁴

¹*Department of Poultry and Fish Diseases, Faculty of Veterinary Medicine, Al-Fateh University, Tripoli, Libya*

²*Department of Veterinary Pathology, College of Veterinary Science, GADVASU, Ludhiana, India*

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Canada*

⁴*Department of Livestock Production and Management, College of Veterinary Science, GADVASU, Ludhiana,
India*

TAMIL N

PHARMACOVIGILANCE I

Ref: Lr. Dated: 27.01.2015, R

S. No	Lab No.	Sender's no
1.	2230	1
2.	2231	2

TO
M/s. N. Nagendran,
CLS - Department,
Kemin Industries South Asia
#39, The Trapezium,
Nelson Manickam road,
Chennai - 600 029.

TAMIL NADU

PHARMACOVIGILANCE LAB

Ref: Lr. Dated: 10.07.2014, Receiv

S. No	Lab No.	Sender's no
1.	531	Silo - 41
2.	532	Silo - 43
3.	533	Silo - 46

Invoice No: 30 date: 18.07.2014

TO
Mr. N. Nagendran,
Kemin Industries South Asia Pvt
No. 39, Nelson Manickam road,
Chennai - 600 029.



Phone No: 044 - 25550111
Fax No. : 044 - 25550111
Email: plaffs@tanuvas.org.in

TAMIL NADU VETERINARY AND ANIMAL SCIENCES UNIVERSITY
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Centre for Animal Health Studies
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PHARMACOVIGILANCE LABORATORY FOR ANIMAL FEED AND FOOD SAFETY

TEST REPORT

S.O.P. AOAC

Serial No. 5036

Date: 13.11.2014

Ref: Lr.Dt: 05.11.2014 Received on 08.11.2014

S. No	Lab No.	Sender's no	Type of specimen	Analyte Result
1.	1578	-	Feed No - I Egg 25	Chlorpyrifos - 50ppb
2.	1579	-	Feed No - II Egg 51 -80	Chlorpyrifos - 150ppb
3.	1580	-	No - III Maize	Chlorpyrifos - 100ppb

Invoice No, 101 Date: 13.11.2014 for Rs. 1800/- enclosed.

TO
M/s. Nagendran . N,
Team leader - CLS,
Kemin Industries South Asia Pvt Ltd,
39, The Trapezium,
Nelson Manickam road,
Chennai - 29.

Scientist Incharge
PLAFFS
Centre for Animal Health Studies
Madhavaram Milk Colony, Chennai - 51.

2.6 Challenge - New castle Disease . Genotype VII.

Newcastle is there from time memorial .

What is new ?



Journal of Veterinary Science

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J Vet Sci. 2015 Dec; 16(4): 447–457.

PMCID: PMC4701737

Published online 2015 Dec 17. doi: [10.4142/jvs.2015.16.4.447](https://doi.org/10.4142/jvs.2015.16.4.447)

Characterisation of genotype VII Newcastle disease virus (NDV) isolated from NDV vaccinated chickens, and the efficacy of LaSota and recombinant genotype VII vaccines against challenge with velogenic NDV

Kiarash Roohani,¹ Sheau Wei Tan,^{✉1} Swee Keong Yeap,¹ Aini Ideris,^{1,2} Mohd Hair Bejo,^{1,2} Abdul Rahman Omar^{1,2}

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Abstract

Go to:

A Newcastle disease virus (NDV) isolate designated IBS002 was isolated from a commercial broiler farm in Malaysia. The virus was characterised as a virulent strain based on the multiple basic amino acid motif

ishing secure connection...

length of the C-terminus extension of the



Phylogenetic analysis using the 374-nucleotide partial fusion gene sequence shows that the recent Pakistani isolates 2007/PK/32, 2007/PK/33, 2006/PK/27, and 2008/PK/43 form a distinct cluster within genotype VII viruses and are most related to a 1989/Japan isolate (see Fig. S2A and Table S2 in the supplemental material). The Mukteswar (1974/PK/1) vaccine virus is distant from these and grouped with many recent Asian genotype III to IV viruses. The remaining four isolates obtained from 1995 to 2005, 2004/PK/23, 1995/PK/16, 2005/PK/26, and 2004/PK/22, are closely grouped among genotype VI viruses.



Check for updates



Complete Genome Sequence of a Newcastle Disease Virus Isolate from an Outbreak in Central India

Polakshee Gogoi^a, Sudhir Morla^a, Megha Kaore^b, Nitin Vasantrao Kurkure^b,
Sachin Kumar^a

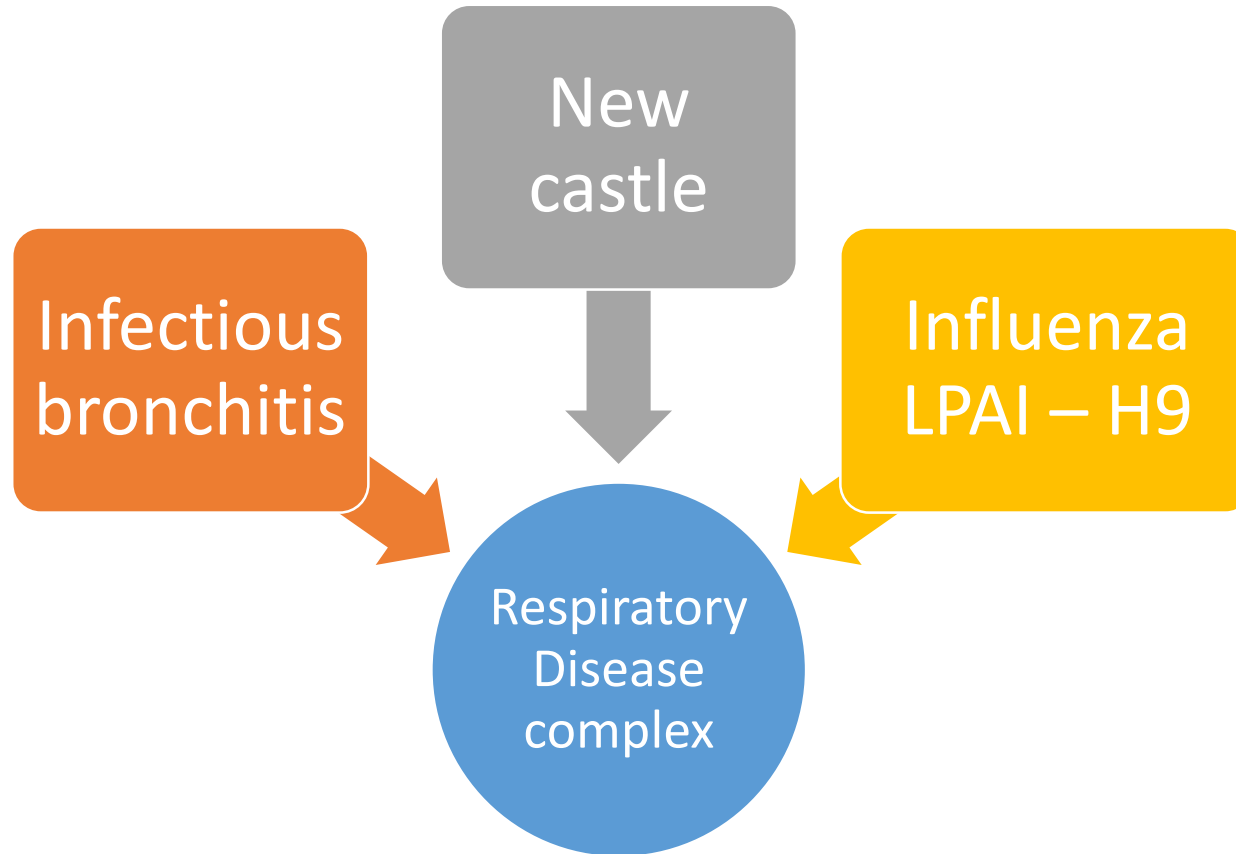
Author Affiliations

ABSTRACT

The complete genome sequence of a Newcastle disease virus (NDV) strain NDV/Chicken/Nagpur/01/12 was isolated from vaccinated chicken farms in India during outbreaks in 2012. The genome is 15,192 nucleotides in length and is classified as genotype VII in class II.

FOOTNOTES

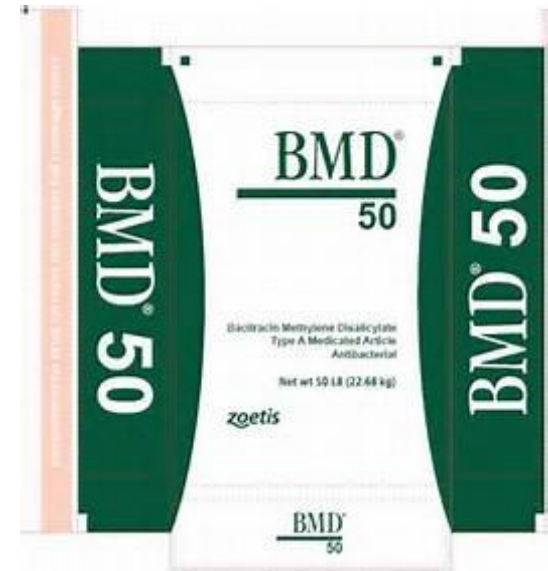
Respiratory Disease complex



3. Alternatives , Future research focuses



Productivity improved due to many things
 .One of the thing is AGP”S



“In every seed of good there is always a piece of bad.

Marian Wright Edelman

Here comes Antimicrobial resistance issue (AMR)

Should we defend Or concerned ?

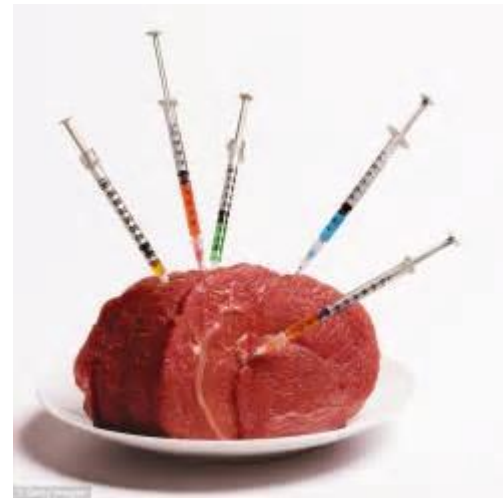


The majority of scientists now agree....



The antimicrobial resistance is an issue

Global perception .

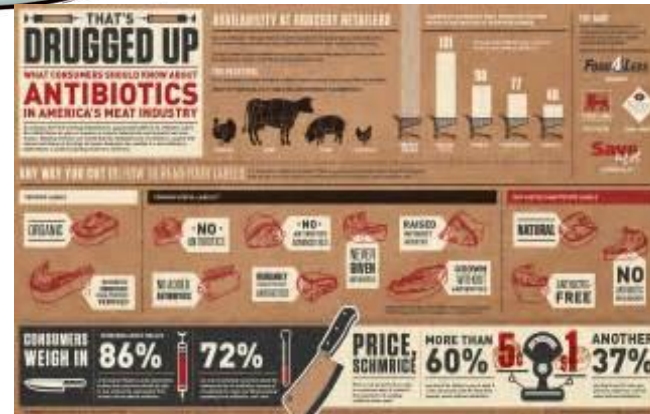


The fear is universal

There are **no antibiotics** in the chicken you buy.



The USDA regulates withdrawal periods to ensure no meat bought at the store contains antibiotics. Learn more at:



Perceptions

Till some time back opinions divided



Current practices



- Few countries Still practice usage of Antibiotic growth promoters (AGP”S) .
- Few Companies voluntarily withdrawn .
- Few countries completely banned .
- Few companies voluntarily withdrawn usage of AGP”S.

Antimicrobial resistance and AGP BAN

concerns about development of antimicrobial resistance and about transference of antibiotic resistance genes from animal to human microbiota, led to withdraw approval for antibiotics as growth promoters in the European Union since January 1, 2006

Poultry science 2007 Nov;86(11):2466-71.

History of the use of antibiotic as growth promoters in European poultry feeds.

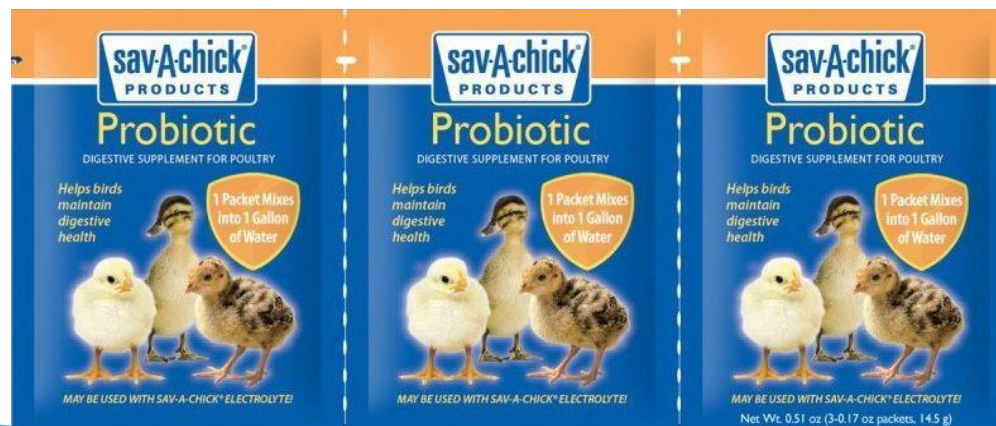
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Alternatives

1. Direct fed Microbials.
2. Prebiotics .
3. Acidification / organic acids .
4. Plant extracts Herbs, spices.
5. Essential oils .
6. Short chain & Medium chain fatty acids .

3.1 Direct fed microbials

In poultry, the early use of probiotics was instituted by [Nurmi & Rantala \(1973\)](#). In their experiments, the authors observed that the intestinal contents of normal adult birds, orally administered to chicks with one day of age, altered their sensitivity to infection by *Salmonella spp.*



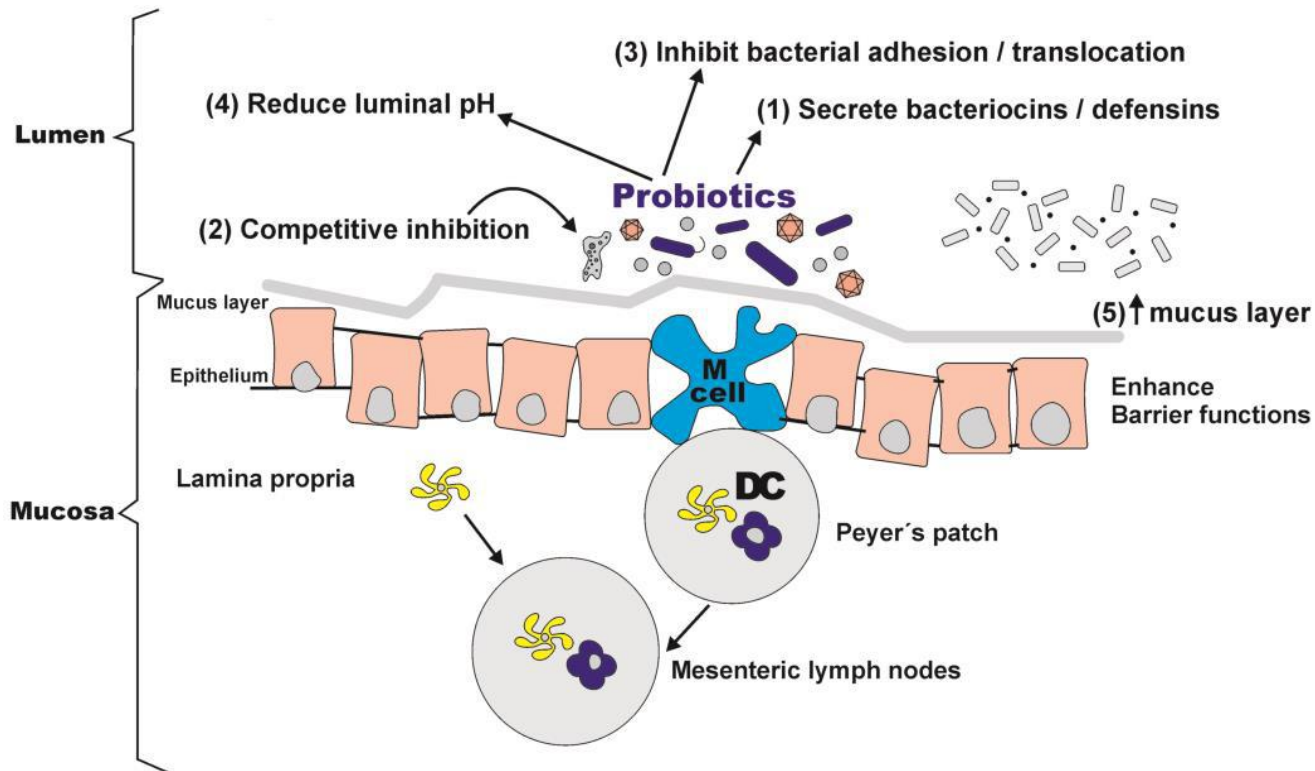


Figure 1. Inhibition of enteric bacteria and enhancement of barrier function by probiotic bacteria. Schematic representation of the crosstalk between probiotic bacteria and the intestinal mucosa. Antimicrobial activities of probiotics include the (1) production of bacteriocins/defensins, (2) competitive inhibition with pathogenic bacteria, (3) inhibition of bacterial adherence or translocation, and (4) reduction of luminal pH. Probiotic bacteria can also enhance intestinal barrier function by (5) increasing mucus production (Adapted Ng et al., 2009).

Direct fed microbials

- GI tract of adult chicken has 10^{12-13} bacteria
- First bacteria if it is pathogenic – consequences are bad .
- The adult animal's existing micro-flora is more likely to exclude the additional bacteria than *vice versa*.
- Consequently, there is less effect of probiotics in older animals than in young animals.

Variability in the effects of Probiotics

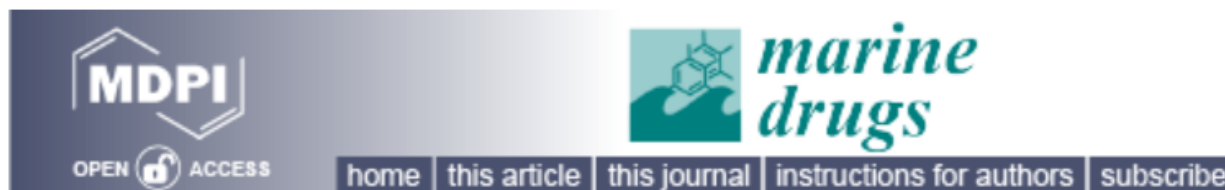
- Failure of the bacteria to survive storage, processing and gastric acids.
- Failure of the bacteria to implant in the gut
- even if two strains are identical, the form which they have been prepared can cause variations in the result ([Fuller, 1995](#)).
- Particularly for controlling the population of *Escherichia coli*, Fuller (1977) reports that such control is dependent on the presence of sufficient number of *Lactobacillus* and that from the results of *in vitro* tests, it seems to be necessary at least 10^7 colony forming units per gram (CFU/g).

3.2 . Prebiotics

- Prebiotics are defined as non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth and activity of one or a limited number of bacteria in the colon (Gibson and Roberfroid, 1995).
- The most common prebiotics are oligosaccharides, which are non-digestible carbohydrates.
- The way in which prebiotics act is by
 - (1) supplying nutrients to beneficial microbes, or
 - (2) tricking pathogenic bacteria into attaching to the oligosaccharide rather than to the intestinal mucosa.
- this reduces the intestinal colonization thereby decreasing the incidence of infection in the birds. Because the oligosaccharide is non-digestible, the microbes that are attached will travel along the GIT with the ingesta, and are excreted from the bird along with other undigested food.

3.2 . Prebiotics

- Fructo oligosaccharides. (FOS)
- Mannan oligosaccharides. (MOS)
- Beta Glucans .
- Combinations of the above .
- Combination of prebiotics and probiotics is synbiotics
-



Mar Drugs. 2010; 8(7): 2038–2064.

PMCID: PMC2920542

Published online 2010 Jul 1. doi: [10.3390/md8072038](https://doi.org/10.3390/md8072038)

Prebiotics from Marine Macroalgae for Human and Animal Health Applications

[Laurie O'Sullivan](#),¹ [Brian Murphy](#),¹ [Peter McLoughlin](#),¹ [Patrick Duggan](#),¹ [Peadar G. Lawlor](#),² [Helen Hughes](#),^{1,*} and [Gillian E. Gardiner](#)¹

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Abstract

Go to:

The marine environment is an untapped source of bioactive compounds. Specifically, marine macroalgae (seaweeds) are rich in polysaccharides that could potentially be exploited as prebiotic functional ingredients for both human and animal health applications. Prebiotics are non-digestible, selectively fermented compounds that stimulate the growth and/or activity of beneficial gut microbiota which, in turn,

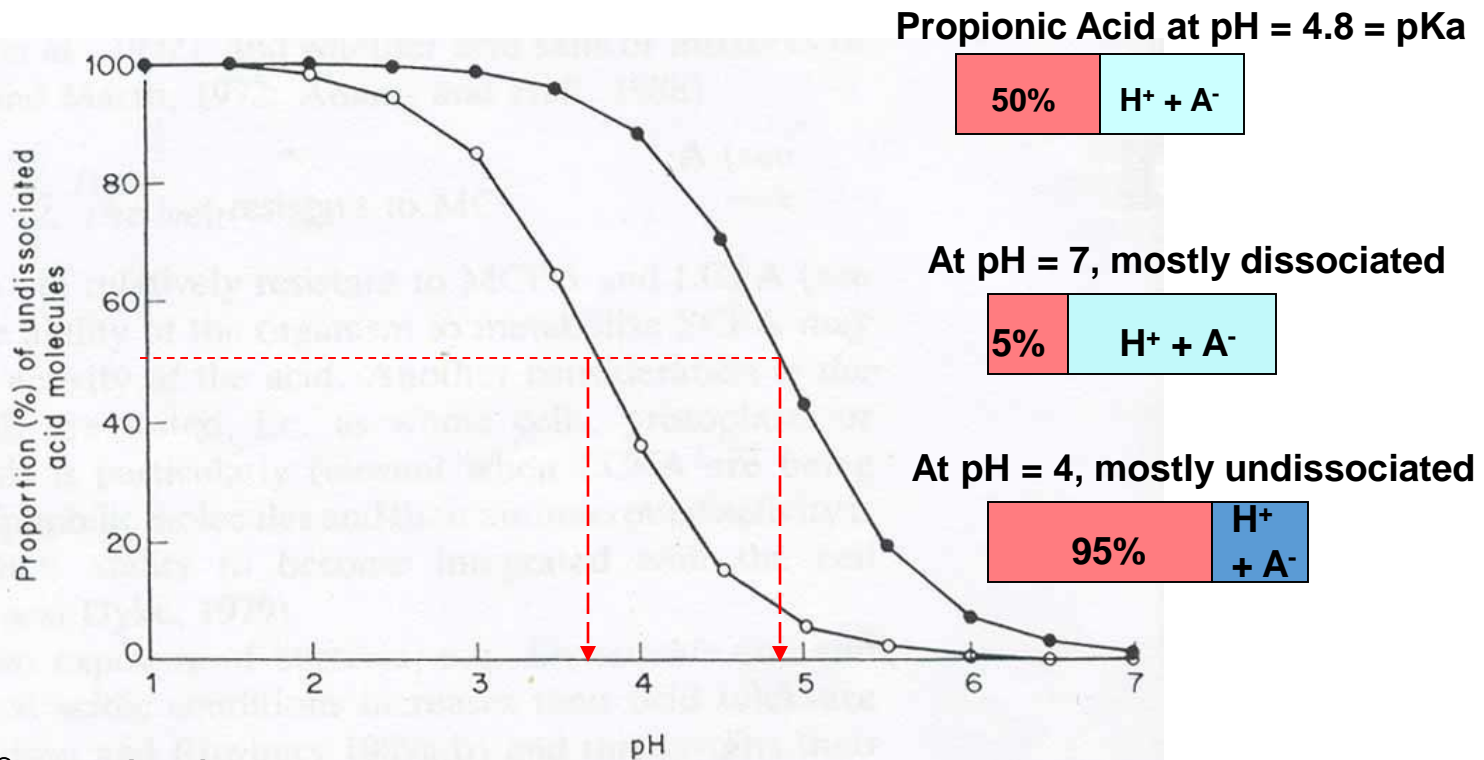
3.3 Acidification

Acids main modes of action as feed ingredients:

- As hygiene promoters, they reduce pH and act as a complexing agent for ions thereby inhibiting microbial growth.
- Reducing pH within the intestinal tract to improve enzyme activity.
- The low pH of the upper gastrointestinal tract provides a competitive advantage to the acidophilic organisms. The lower part of the digestive tract is alkaline (pH 7-8) and more hospitable to potential pathogens
- At low concentrations organic acids have a bacteriostatic effect but at high concentrations they become bactericidal

Organic acids- Antimicrobial Action

- Dissociation constant (pKa) of the acids - pH at which 50% of the acid is dissociated



○ Formic acid

● Propionic acid

Health & Nutrition Poultry Seminar - Dubai - 19th January 2018

3.4 . Plant extracts Herbs, spices

The Plant extracts Do have some effect on Broiler performance and The litter characteristics. The production parameters like Feed conversion ratio show significant difference compared to control group .

Effect of Farmatan BCO® (Sweet Chestnut Wood Tannins and Butyric acid) on Broiler Performance and Litter Characteristics

Samuel Masilomony Ronald¹, Jayaraman K^{2*} and Mojca Osredkar³



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Curcumin

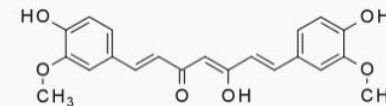
From Wikipedia, the free encyclopedia

Not to be confused with [Curculin](#).

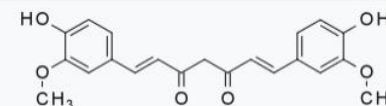
Curcumin is a bright yellow chemical produced by some plants. It is the principal curcuminoid of turmeric (*Curcuma longa*), a member of the ginger family, *Zingiberaceae*. It is sold as an [herbal supplement](#), [cosmetics](#) ingredient, food flavoring, and [food coloring](#).^[1]

Chemically, curcumin is a [diarylheptanoid](#), belonging to the group of curcuminoids, which are [natural phenols](#) responsible for turmeric's yellow color. It is a [tautomeric compound](#) existing in [enolic form](#) in [organic solvents](#), and as a [keto form](#) in [water](#).^[2] Although thoroughly studied in laboratory and clinical studies, curcumin has no confirmed medical uses, and has proved frustrating to scientists who state that it is unstable, not [bioavailable](#), and unlikely to produce useful leads for [drug development](#).^[3]

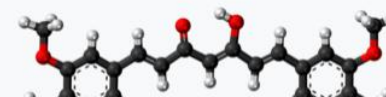
Curcumin



Enol form



Keto form



**EFFECT OF DIETARY SUPPLEMENTATION
OF TURMERIC (*Curcuma longa*) POWDER ON THE
GROWTH PERFORMANCE AND CARCASS TRAITS
OF BROILER CHICKS**

**M. A. Mondal, T. Yeasmin, R. Karim, M. Nurealam Siddiqui^{*1}
S.M. Raihanun-Nabi², M. A. Sayed³ and M.N.A. Siddiky⁴**

Department of Dairy and Poultry Science, Hajee Mohammad Danesh Science and Technology
University (HSTU), Dinajpur, Bangladesh

Based on the results of the present study, it may be concluded that turmeric powder supplemented at a level of 0.5% has significant effect on body weight gain, FCR, abdominal fat content and dressing percentage of broiler, except feed intake and survivability. The results of the study also suggest that the supplementation of turmeric (*Curcuma longa*) powder at 0.5% level in diets has high potential as commercial applications for production performance of broiler. Therefore, turmeric powder can be used along with the other conventional feed ingredients.

Egyptian Poultry Science Journal

<http://www.epsaegypt.com>

ISSN: 1110-5623 (Print) – 2090-0570 (On line)



EFFECT OF DIFFERENT LEVELS OF TURMERIC (CURCUMA LONGA) SUPPLEMENTATION ON BROILER PERFORMANCE , CARCASS CHARACTERISTIC AND BACTERIAL COUNT

Hanan E. Al-Mashhadani

*Anim- Resource Dept., College of Agriculture , University of Baghdad
Baghdad – Iraq*

Table (5): Effect of supplementing different levels of turmeric powder on feed conversion ratio (g.feed/g.gain) of broiler chickens .

Age Days	Control T1	Turmeric levels (%)			Level of significant
		T2(0.2%)	T3(0.4%)	T4(0.6%)	
0-14	1.50 ±0.04	1.50 ±0.06	1.66 ±0.07	1.80 ±0.14	N.S
14-28	1.23 ±0.12	1.60 ±0.14	1.24 ±0.07	1.34 ±0.03	N.S
28-42	2.16 ^a ±0.10	1.50 ^b ±0.14	1.52 ^b ±0.04	1.61 ^b ±0.04	*
0-42	1.63 ^a ±0.05	1.53 ^{ab} ±0.19	1.43 ^b ±0.06	1.52 ^{ab} ±0.01	*

A , b , c Mean in the same raw with different superscripts are significantly ($p < 0.05$) different , N.S-No significant .

3.5 Essential Oils

The new generation of feed additives includes herbs and essential oils, and their beneficial effects for animal production have been well documented

[J Anim Sci Biotechnol](#). 2015; 6(1): 7.

Published online 2015 Feb 24. doi: [10.1186/s40104-015-0004-5](https://doi.org/10.1186/s40104-015-0004-5)

PMCID: PMC4359495

Essential oil and aromatic plants as feed additives in non-ruminant nutrition: a review

Zhaikai Zeng, Sai Zhang, Hongliang Wang, and Xiangshu Piao[✉]

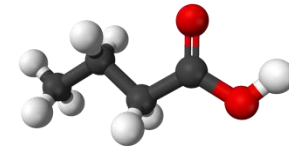
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3.6 short chain fatty acid

- Short-chain fatty acids (SCFA) act as bio regulators and gut growth promoters in non ruminants.

Butyric acid a SCFA is widely reported as

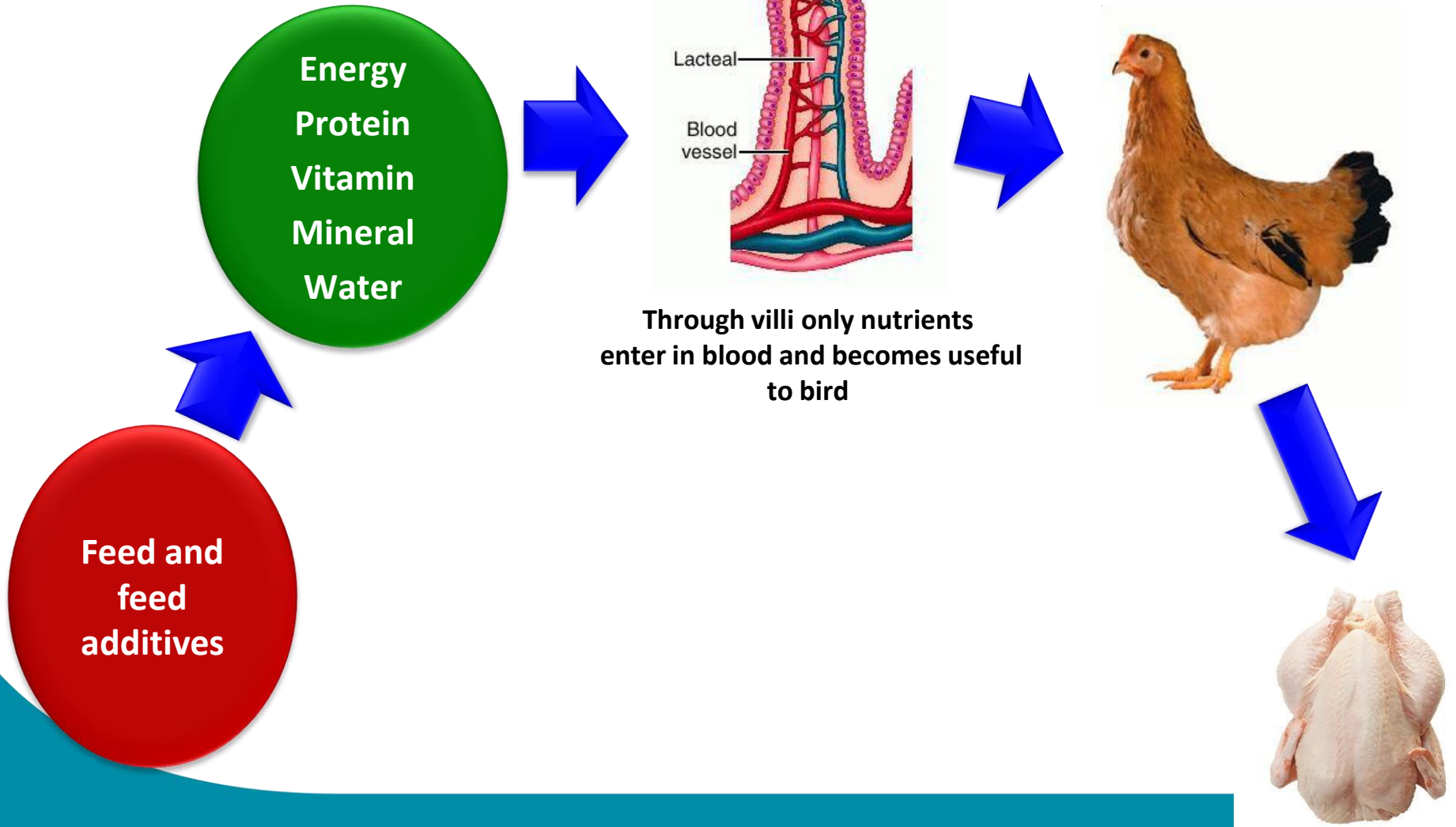
- Development promoter of gut wall tissues
- Important growth modular of symbiotic intestinal micro flora
- Main enterocytes energy source
- Essential for Gut Associated Lymphoid Tissue (GALT)
- Bactericidal and a stimulant of villi growth.
- Increases the humoral immunity



References

- Friedman et al. 2005. Proceeding of 15th European Symposium on Poultry Nutrition, Hungary pp-234-242

Importance of absorption



3.7 . Combination of esterified MCFA and SCFA

Esterified butyrate and Monolaurate

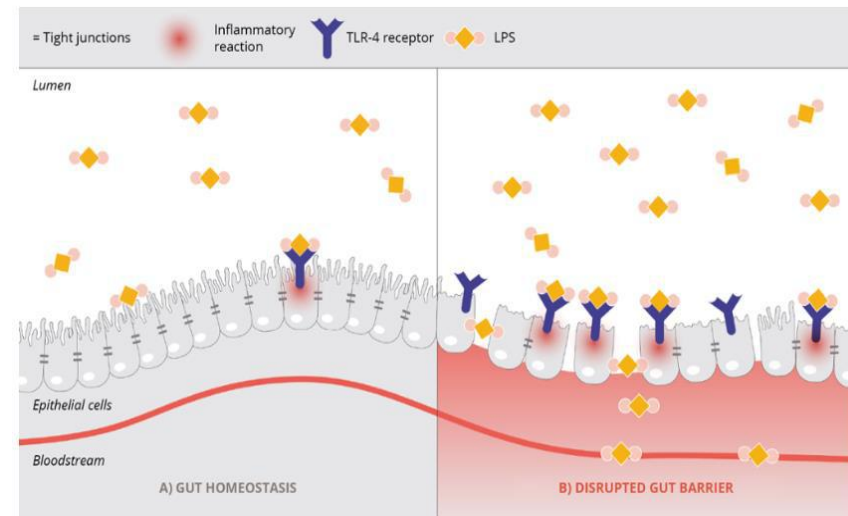
- Once in the cell, the MCFA dissociates followed by a drop in pH and results in the inactivation of the bacterial cell. The MCFA inhibits the production of lipases by the bacteria (Dierick et al. 2002)
- As lipases are needed to allow the bacteria to attach to the intestinal wall, this process will be prohibited and the bacteria will be washed out (Diericke et al.2002)

4. Future focuses .

4.1 Intestinal epithelial barrier – nutritional modulation

- The intestinal epithelial barrier is the most critical element of maintaining an intact intestinal barrier and made up of a layer of columnar epithelial cells and intercellular junctional complexes including tight junctions, adherens junctions and desmosomes.
- Tight junctions(TJ), which are formed by proteins including occludin, claudins, junctional adhesion molecule and zonula occludens(ZO), are primarily responsible for the permeability of the paracellular pathway

Figure 2 - Transfer of endotoxins from the lumen into the bloodstream.



- The epithelial selective permeability includes two pathways: the transcellular and the paracellular pathway.
- The transcellular pathway is involved in the absorption and transport of nutrients, including sugars, amino acids, peptides, fatty acids, minerals, and vitamins. As the cell membrane is impermeable, this process is predominantly mediated by specific transporters or channels located on the apical and basolateral membranes.
- The paracellular pathway is associated with transport in the intercellular space between the adjacent epithelial cells. These epithelial cells are tightly bound together by intercellular junctional complexes that regulate the paracellular permeability and are crucial for the integrity of the epithelial barrier.

Bacterial translocation

The disruption in barrier functions was associated with viral and bacterial translocation across the epithelial monolayers. Bacterial translocation is defined as the passage of viable bacteria from the intestinal tract through the epithelial mucosa into extra-intestinal organs.

Impaired mucosal surfaces can increase vulnerability of the intestinal epithelium with an augmented risk of bacterial and viral penetration, or bacterial overgrowth in the in the intestine .

L46 Intestinal epithelial barrier in poultry: function and nutritional modulation

Yuming Guo, Dan Liu, Bingkun Zhang

State Key Laboratory of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing 100193, China

Nutritional strategies to modulate the intestinal epithelial barrier in poultry

- Zn as supplementation in diet reduced gut lesion scores, and reduced intestinal permeability.
- Zn (as ZnSO₄) up-regulated occludin and claudin-1 mRNA expression in the ileum and tended to reduce plasma endotoxin levels of chickens challenged with *Salmonella Typhimurium*, suggesting that regulation of occludin and claudin1 expression by Zn may be involved in ameliorating increased intestinal permeability induced by *Salmonella Typhimurium* challenge. (Zang et al 2012).

- **Probiotics**

- compared to treatments with *Saccharomyces boulardii* and *Bacillus subtilis* B10, the tight junctions of jejunum and ileum of broilers were comparatively loose in the control group, and *Saccharomyces boulardii* and *Bacillus subtilis* B10 also improved the epithelial tight junctions through increasing occludin, claudin2, and claudin3 mRNA expression levels in broiler intestine.
- *L. fermentum* 1.2029 was able to ameliorate the severity of necrotic enteritis lesions and inflammation and improve epithelial barrier through increasing claudin-1 and occludin levels in necrotic enteritis - infected chickens .

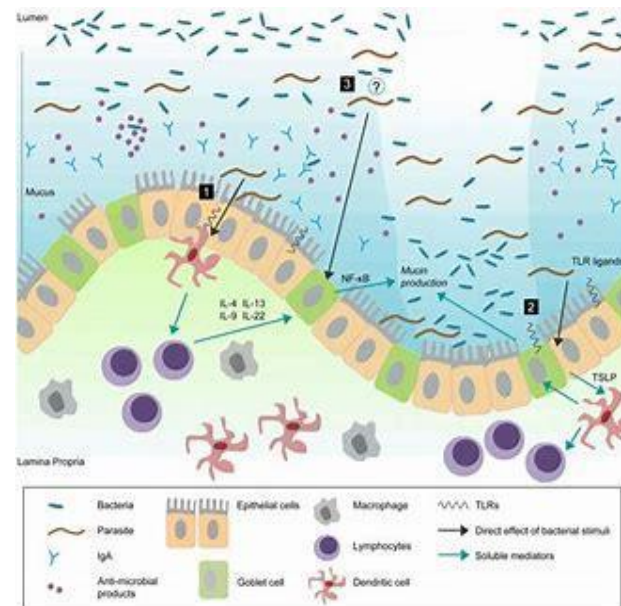
Prebiotics

- Cello-oligosaccharide is a functional oligosaccharide obtained from plant cellulose.
- supplemental cello-oligosaccharide increased jejunal villus height and villus height to crypt depth ratio, as well as decreased jejunal paracellular permeability of fluorescein isothiocyanate dextran in broiler chickens, which demonstrated that cellooligosaccharidesupplementation partially ameliorated the adverse effects caused by heat stress in broilersthrough improving intestinal microflora, morphology and barrier integrity *
- Algae are rich in polysaccharides that bypass digestion at the upper parts of the gut and can serve as substrate for microbial growth at the lower part of the gut (two conditions necessary for all prebiotics).

* SONG, J., JIAO, L.F., XIAO, K. (2013) Cello-oligosaccharide ameliorates heat stress-induced impairment of intestinal microflora, morphology and barrier integrity in broilers[J]. *Animal Feed Science and Technology*, 185:175-181.

Mucin

Mucin. Production. The first line of defense of the mucosa against luminal contents is the mucous layer, which is mainly composed of high-molecular-weight glycoproteins ... that interfere with the bacterial receptors by binding to them and thus preventing **bacterial attachment** to the same sugar on microvillus glycoconjugates.



GI Microbiota and Regulation of the Immune System

edited by Gary B. Huffnagle, Mairi Noverr

Salmonella

Staphylococcus

Intestine

E coli

Pseudomonas

4.3 . Immune modulation



FUTURE RESEARCH TRENDS

FEED MODULATION OF FOOD SAFETY AND QUALITY

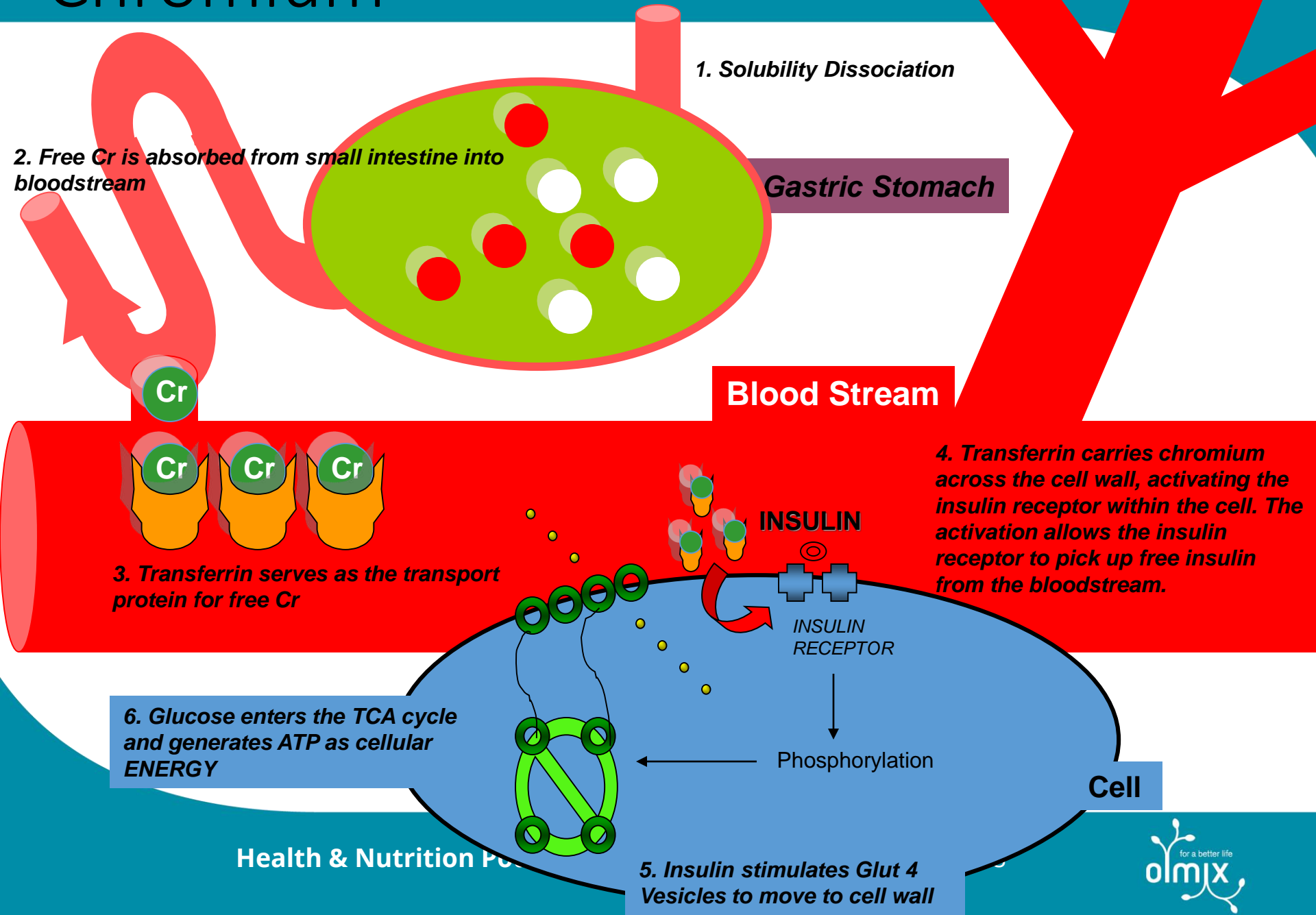
NUTRITION AND EPIGENETIC REGULATION OF GENE EXPRESSION

Nutrients and nutraceuticals influence both gene expression and epigenetic mechanisms that in turn influence gene expression

NUTRITION AND GASTROINTESTINAL IMMUNITY

Gastrointestinal tract is major site of immune system.

Chromium

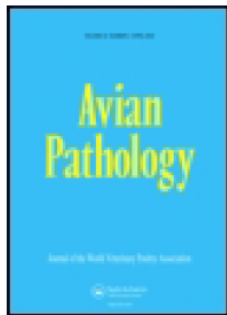


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Avian Pathology

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/cavp20>

Pathogenesis of pancreatic atrophy by avian influenza a virus infection

K. Shinya^a, T. Awakura^a, A. Shimada^a, F. D. Silvano^a, T. Umemura^a & K. Otsuki^a

^a Departments of Veterinary Pathology and Public Health, Faculty of Agriculture, Tottori University, Tottori, 680, Japan

Available online: 12 Nov 2007

To cite this article: K. Shinya, T. Awakura, A. Shimada, F. D. Silvano, T. Umemura & K. Otsuki (1995): Pathogenesis of pancreatic atrophy by avian influenza a virus infection, Avian Pathology, 24:4, 623-632

To link to this article: <http://dx.doi.org/10.1080/03079459508419102>

Chromium in Avian influenza & ND

Dietary Cr supplementation increased antibody titers against Newcastle and Influenza virus (Table 3). The role of Cr in the immune responses of mammals and chicken is well established (Burton *et al.*, 1993; Lee *et al.*, 2003). It has also been reported that chromium modulates the immune response through its effect on cytokine release (Wang *et al.*, 1996). However, the results obtained so far

Effect of different levels of chromium chloride on performance and antibody titre against Newcastle and Avian Influenza virus in broiler chicks

FARSHID KHEIRI^{1*} and MAJID TOGHYANI²

¹Department of Animal Science, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran. ²Department of Animal Science, Islamic Azad University, Khorasgan Branch, Iran.

*Corresponding author: farshid_kheiri@yahoo.com

Dietary Cr supplementation increased antibody titers against Newcastle and Influenza virus (*Table 3*). Elevated antibody titer against Newcastle disease was reported in broiler chicks with supplement of 2 or 10 ppm Cr, either in the form of CrCl₃ or yeast (Guo et al., 1999). Lee et al. (2003) reported antibody titer against Infectious bronchitis was improved in broiler chicks fed 400 ppb Cr picolinate.

Immune modulation

- The cell wall of algae is an extremely complex structure composed of distinct polysaccharides. Some of these compounds appear to enhance the immune activity of animals.
- polysaccharides from red algae, have been shown to improve the immunomodulating activities in mammals by modifying the activity of macrophages stimulating phagocytosis.
- green algae also exert immunomodulating properties by activating the expression of some cytokines and chemokines involved in innate and adaptive immune response
- BY [IOANNIS MAVROMICHALIS](#)_AUGUST 17, 2015 WATTNET .

Approach 5 .Better hepatic care



With poultry farming becoming marginal more intensive enhancing farm productivity by improving feed utilization has become a core issue. The liver, being one of the most vital organs of the body, constitutes the lifeline system of animal. This organ also plays a major role in the digestion, metabolism and utilization of feed nutrients.

Functions of liver

- produce bile to digest fats (stored in gall bladder).
- detoxification
- store fat and fat-soluble vitamins (i.e., A,D,E, K)
- metabolize fats, carbohydrates, and proteins that are in the diet.

Reasons for liver damage

- The principal cause is thought to be excessive calorie intake.
- exposure to the mycotoxin aflatoxin, fumonisin
- calcium deficiency
- stress
- An incorrect protein:energy balance.

Steatosis

When are layers at risk to develop FLS

- During peak production, young laying hens are not always able to increase their feed intake to such a level that it meets the energy requirements for egg production. As a result, they will start to convert carbohydrates to fatty acids, a process which takes place in the liver. If transport of fatty acids out of the liver can't match production, fat starts to accumulate in the liver, resulting in FLS.
- At the end of the laying cycle, lower egg production results in lower energy requirement of the birds. If feed intake is not reduced, excess carbohydrate is metabolized into fatty acids in the liver. This may result in an increase in fat deposition in the liver, resulting in FLS.

Management of fat metabolism

Fatty liver syndrome in hens is a perennial problem with no current solution. To this end, certain extracts from algae might prove to be beneficial as they have shown to possess strong activity against hyperlipidemia.



Volume 89, Issue 11
November 2010

Article Contents

Cytochrome P450 enzymes involved in the metabolism of aflatoxin B1 in chickens and quail FREE

G. J. Diaz ✉, H. W. Murcia, S. M. Cepeda

Poultry Science, Volume 89, Issue 11, 1 November 2010, Pages 2461–2469,

<https://doi.org/10.3382/ps.2010-00864>

Published: 01 November 2010 **Article history ▼**

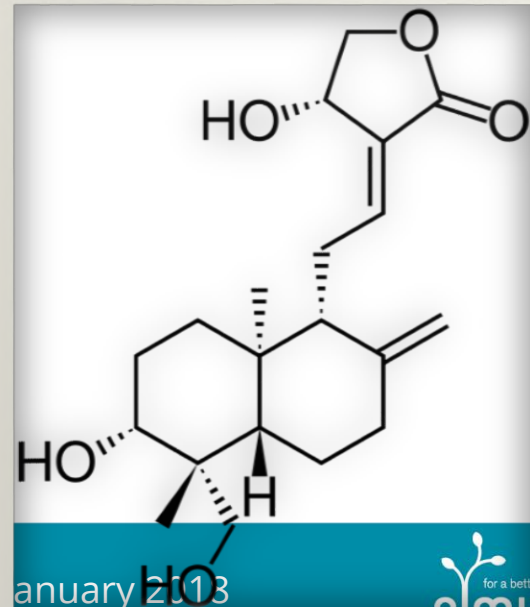
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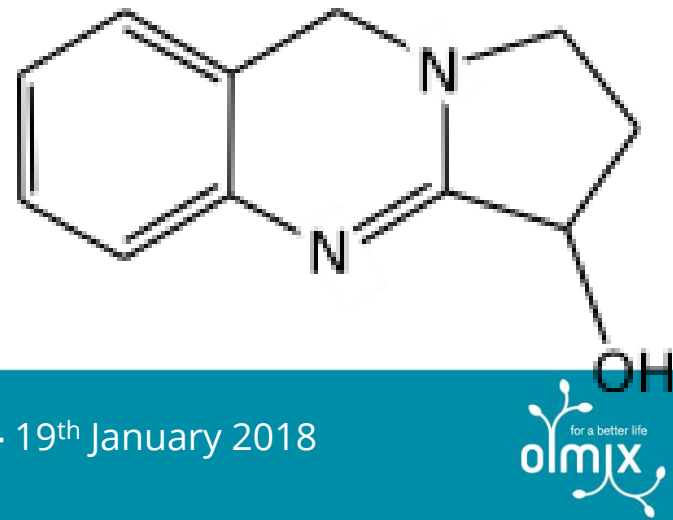
QC OF HERBAL DRUGS

- The quality assurance of herbs still remains a challenge because of the **high variability of active components** involved.
- **Season** has impact on availability of active principles in medicinal plants.
- Accession from a specific **geographical region** has impact on yield of active principles.
- **Aging and stage of development** also determines active principles.
- **Shelf-life and transportation** are other factors responsible for variation of active principles in herbs purchased from the market.

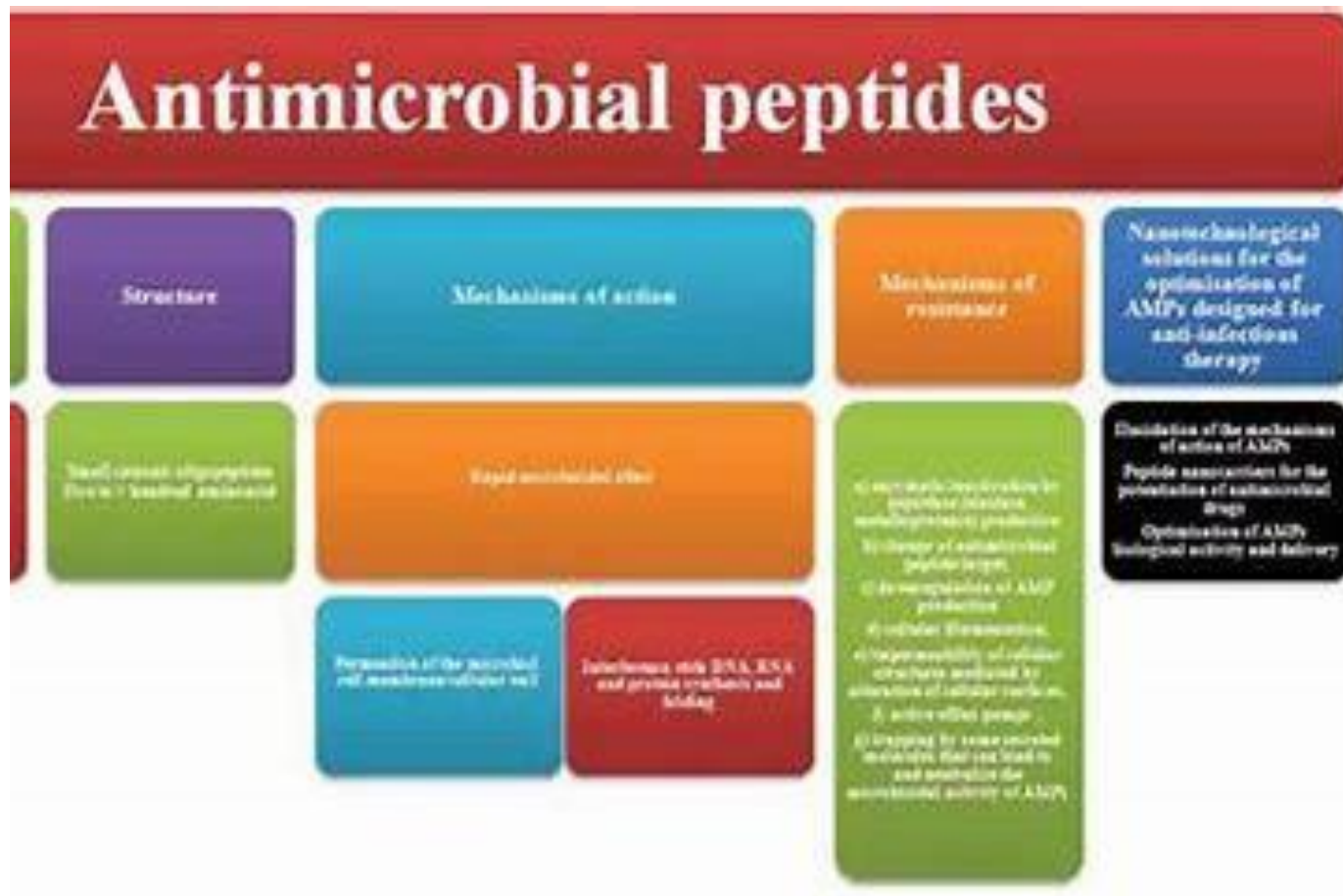
- An **experiment** was conducted to determine the **effect of aging on andrographolide content in *A. paniculata*** and to establish the best harvesting time.
- The **growth and yield parameters were studied** at 30, 60, 90, 120 and 150 days after sowing.
- The **best harvesting time was observed at 120 days** after sowing, containing maximum andrographo-lide content.



- *Adhatoda vasica* is a bronchodilator herb. The plant shows wide seasonal variation in vasicine content in its leaves.
- It exhibited higher levels of vasicine twice in a year i.e. 3.0% in March and 1.4% in September.
- Interestingly, it coincided with the flowering of the plant. In March, it was full bloom condition and in September, it was partial flowering.
- During the vegetative stage, the plant contained very low concentration of vasicine (0.54% on DM basis).



Antimicrobial peptides





Int J Mol Sci. 2016 May; 17(5): 603.

PMCID: PMC4881439

Published online 2016 May 3. doi: [10.3390/ijms17050603](https://doi.org/10.3390/ijms17050603)

Antimicrobial Peptides as Potential Alternatives to Antibiotics in Food Animal Industry

[Shuai Wang](#), [Xiangfang Zeng](#), [Qing Yang](#), and [Shiyan Qiao](#)*

Antonella Piozzi, Academic Editor

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Abstract

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Nutrition

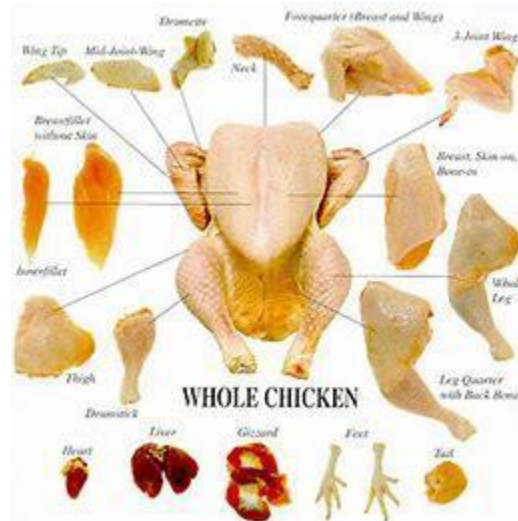
News | Oct 2, 2013 | 2028 views | update:Mar 9, 2016

Effect of antimicrobial peptide on broiler performance

ABSTRACT: A South Korean study investigated the effects of dietary supplementation of antimicrobial peptide-P5 (AMP-P5) on growth performance, nutrient retention, excreta and intestinal digesta microflora and intestinal morphology of broilers.

These results indicate that dietary supplementation with 60 mg AMP-P5/kg has the potential to improve the growth performance, nutrient retention, intestinal morphology and reduce intestinal and excreta coliforms in broilers.

The main challenge in the future is not only to produce more, but also to do this in a sustainable and safe way.



How we are going to achieve this ?

The Foresight report

five key challenges for the global food system:

- balancing future demand and supply sustainably – to ensure that food supplies are affordable;
- ensuring there is adequate stability in raw material supplies – and protecting the most vulnerable from the volatility that does occur;
- achieving global access to novel and efficient technologies to produce efficient & safe food
- managing the contribution of the food system to the mitigation of food security ;
- maintaining biodiversity and ecosystem services while feeding the world.



thanks!