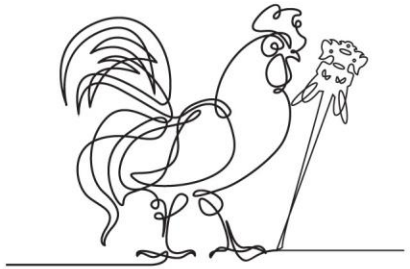

23rd European Symposium on Poultry Nutrition

ESPN 2023

RIMINI/ITALY JUNE 21 - 24

Oxidative stress in poultry: a holistic overview from the animal to the final consumer

Mario Estévez DVM, PhD. Professor Meat Science & Technology, Universidad de Extremadura, Spain

OUTLINE

1. INTRODUCTION

2. OXIDATIVE STRESS: CAUSES AND CONSEQUENCES

3. ANTIOXIDANT PROTECTION OF POULTRY

4. FINAL REMARKS

ESPN 2023

RIMINI/ITALY
JUNE 21 - 24

1. INTRODUCTION

Nutritionist: the final objective – producing desirable meat

GENETICS

FEEDS

HANDLING

WRONG DECISIONS?

PROMOTING OXIDATIVE STRESS

MEAT QUALITY

RIGHT DECISIONS?

PROTECTION AGAINST OXIDATION

NUTRITIONAL VALUE

SENSORY PROPERTIES

HEALTH OF CONSUMERS

OUTLINE

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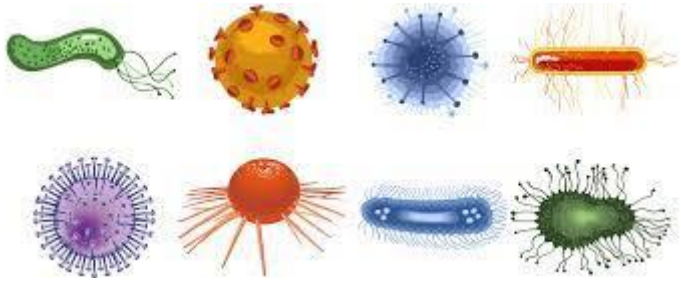
ESPN 2023

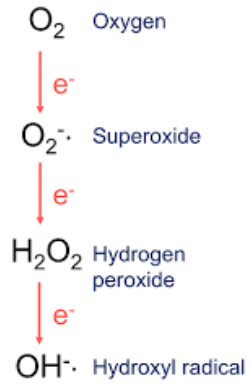
RIMINI/ITALY
JUNE 21 - 24

2. OXIDATIVE STRESS: CAUSES AND CONSEQUENCES

BIOLOGICAL THREATS



CHEMICAL THREATS



ENDOGENOUS

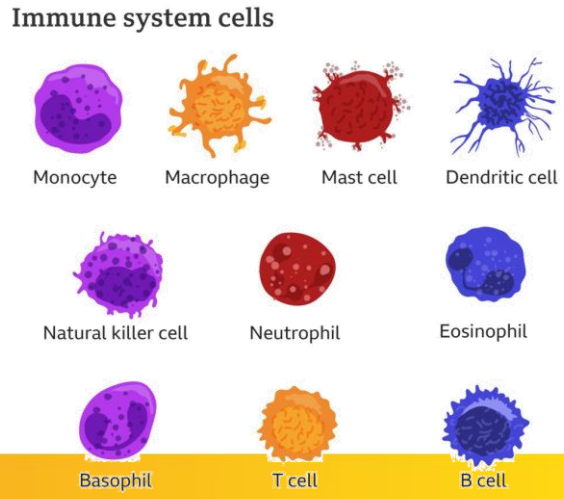
FREE RADICALS

REATIVE OXYGEN SPECIES

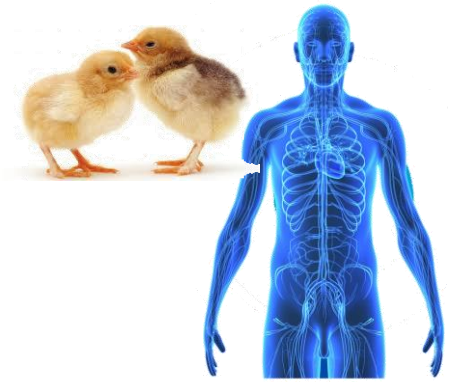
EXOGENOUS

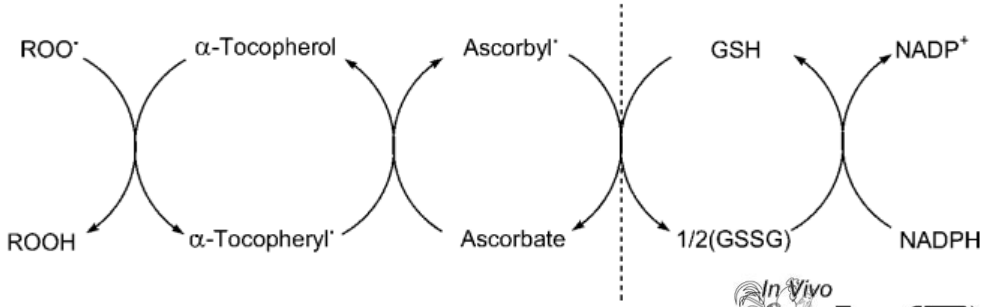
OXIDIZED FEEDS/FOODS
HEAT STRESS
POLLUTION
TOXIC HABITS

INMUNE SYSTEM



ANTIOXIDANT DEFENCE SYSTEM





2. OXIDATIVE STRESS: CAUSES AND CONSEQUENCES

DEGRADATION
PROOXIDANT

IMBALANCE
BALANCE

DAMAGE
ANTIOXIDANT

TOCOPHEROLS
CATALASE
SUPEROXIDE DISMUTASE
GLUTATHION

UNCONTROLLED
OXIDATION

BIOMOLECULES

LIPIDS DNA PROTEINS

FUEL MOLECULES

O_2

ROS

ENERGY

OXIDATIVE STRESS

Chemical damage caused by ROS to biomolecules

HOMEOSTASIS

2. OXIDATIVE STRESS: CAUSES AND CONSEQUENCES

ANIMAL

CAUSES

- Intake of oxidized feeds
- (Myco)toxins
- Heat exposure
- High growth rates

IMPACT

- Low growth rates
- Immune system impairment
- Diseases
- Low quality products

MEAT/MEAT PRODUCTS

CAUSES

- Processing
- Cooking
- Mincing
- Oxygen exposure

IMPACT

- Rancidity
- Discolouration
- Altered texture/digestibility
- Loss nutritional value
- Accretion of toxic compounds

CONSUMERS

CAUSES

- Intake of oxidized foods
- Toxic habits
- Pollution
- Exposure to sunlight

IMPACT

- Dysbiosis
- Immune system impairment/ Inflammation
- Chronic pathologies
- Aging

OXIDATIVE REACTIONS ARE INHERENT TO BIOLOGICAL SYSTEMS

OXIDATION (OXIDATIVE STRESS) TAKES PLACE ALL THE WAY FROM FARM TO FORK

2. OXIDATIVE STRESS: CAUSES AND CONSEQUENCES

OXIDATIVE STRESS IS INVOLVED IN THE ONSET OF MYOPATHIES

WOODEN BREAST

WHITE STRIPING

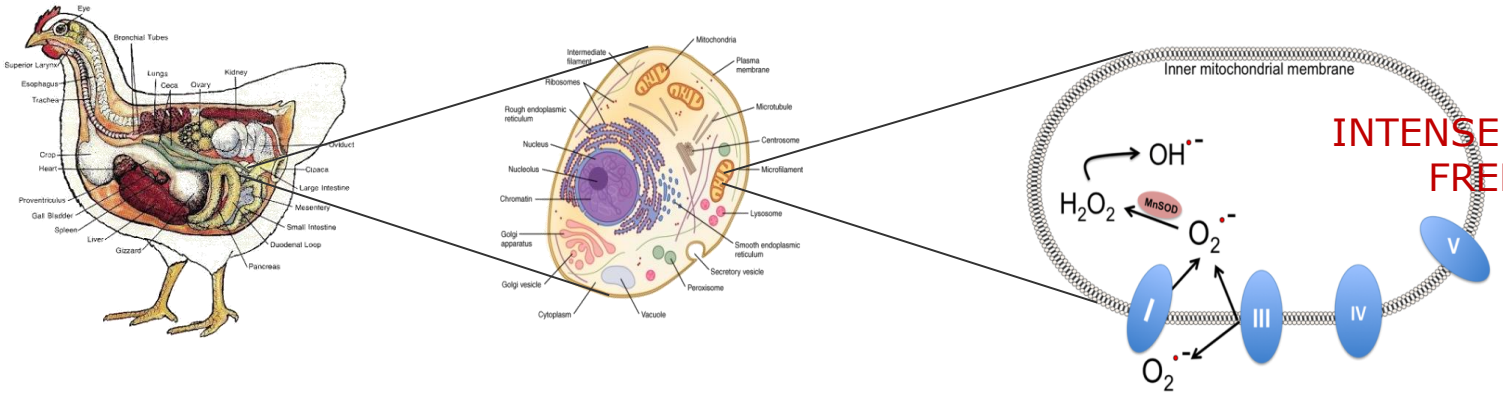
SELECTION OF HIGH-GROWTH RATE AND HIGH BREAST YIELD CHICKEN HYBRIDS

FAST MUSCLE GROWTH REQUIRES ACCELERATED METABOLISM (INCREASED ENERGETIC DEMAND)

FRENETIC MITOCHONDRIAL ACTIVITY

SUPPORTIVE TISSUE (VASCULAR) IS COMPROMISED (HYPOXIA)

POOR MITOCHONDRIAL EFFICIENCY



INTENSE GENERATION OF FREE RADICALS

OXIDATIVE STRESS

DAMAGE TO BIOMOLECULES/ UPREGULATION OF GENES RELATED TO FIBROSIS/LIPIDOSIS

2. OXIDATIVE STRESS: CAUSES AND CONSEQUENCES

RESEARCH ARTICLE

PLOS ONE

Oxidative Stress and Metabolic Perturbations in Wooden Breast Disorder in Chickens

Behnam Abasht[1]*, Marie F. Mutryn[1], Ryan D. Michalek[2], William R. Lee[3]

Research Article SCI

Received: 8 June 2020 Revised: 27 July 2020 Accepted article published: 24 August 2020 Published online in Wiley Online Library:

(wileyonlinelibrary.com) DOI 10.1002/jsfa.10747

Pinpointing oxidative stress behind the white striping myopathy: depletion of antioxidant defenses, accretion of oxidized proteins and impaired proteostasis

Leila M Carvalho,[a] Josué Delgado,[b] Marta S Madruga[a] and Mario Estévez[c]*

Contents lists available at ScienceDirect

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Deciphering the underlying mechanisms of the oxidative perturbations and impaired meat quality in Wooden breast myopathy by label-free quantitative MS-based proteomics

Leila M. Carvalho[a], Thayse C. Rocha[a], Josué Delgado[b], Silvia Díaz-Velasco[c], Marta S. Madruga[a], Mario Estévez[c,*]

OUTLINE

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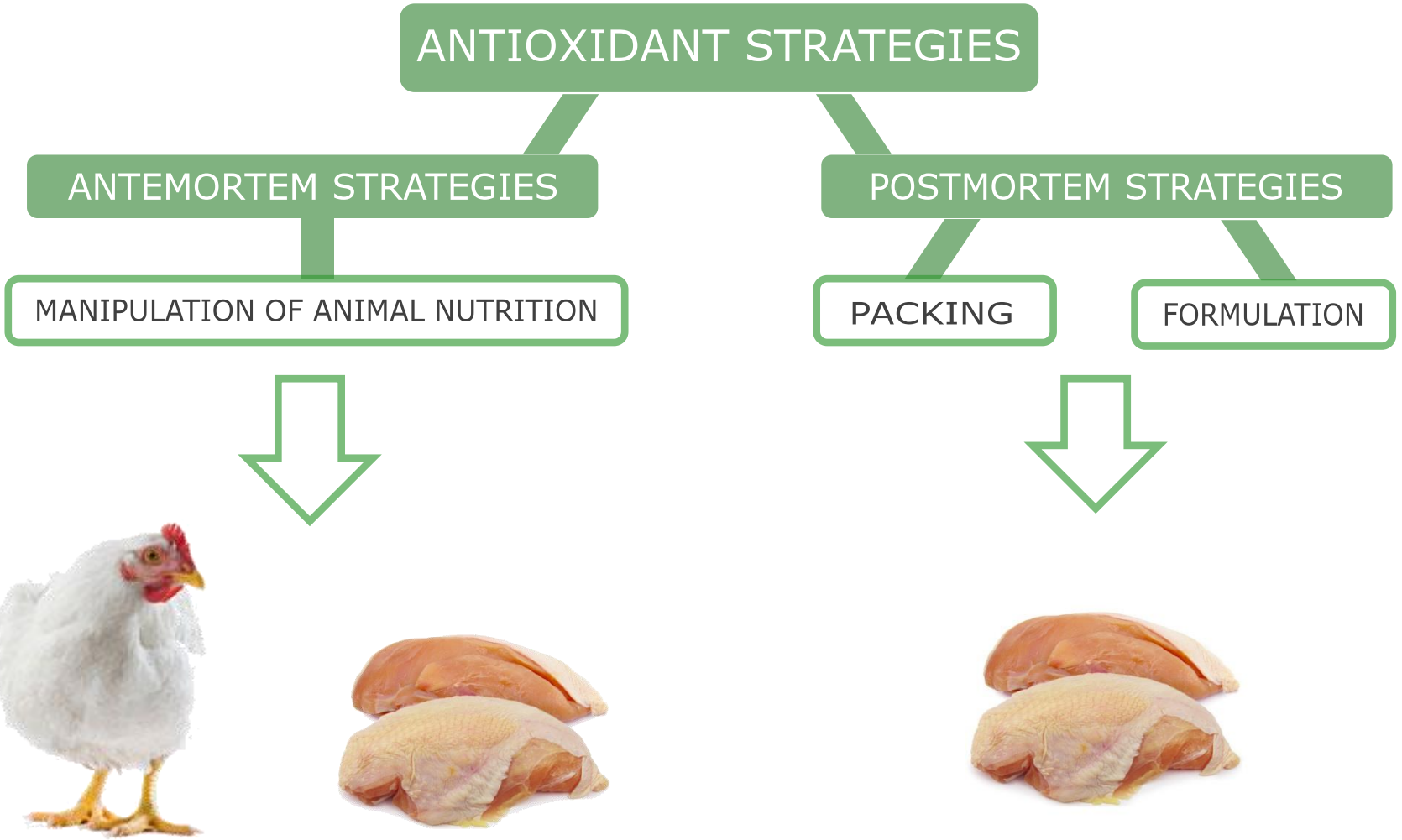
ESPN 2023

RIMINI/ITALY
JUNE 21 - 24

3. ANTIOXIDANT PROTECTION OF POULTRY



3. ANTIOXIDANT PROTECTION OF POULTRY

ANTIOXIDANT STRATEGIES

ANTEMORTEM STRATEGIES

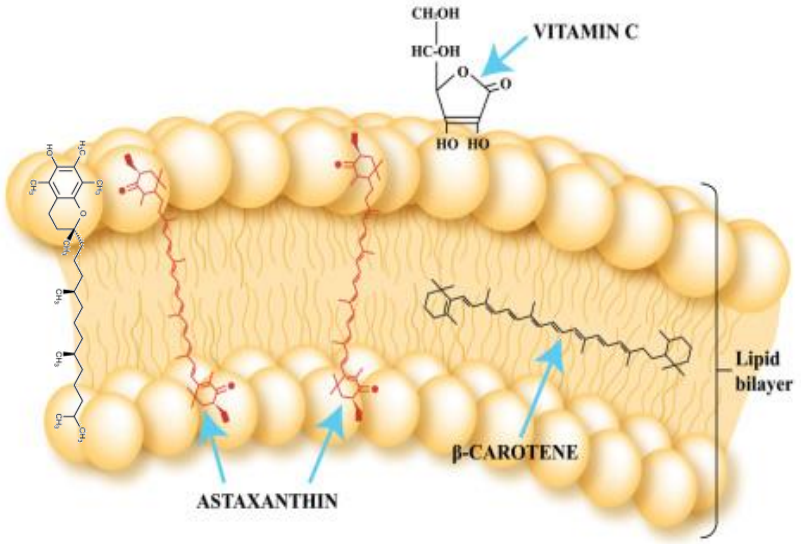
MANIPULATION OF ANIMAL FEEDS TO STRENGTHEN THE ENDOGENOUS ANTIOXIDANT DEFENSES

COMPONENTS OF ANTIOXIDANT DEFENSES

TOCOPHEROL SUPPLEMENTATION **150 ppm**

METHIONINE SUPPLEMENTATION

SELENIUM SUPPLEMENTATION



Effect of Supplemental Vitamin E in Control of Rancidity in Poultry Meat

W. L. Marusich, E. De Ritter, E. F. Ogrinz, J. Keating, M. Mitrovic and R. H. Bunnell
Animal Health Research Department and Product Development Department, Hoffmann-La Roche Inc., Nutley, New Jersey 07110

(Received for publication August 30, 1974)

3. ANTIOXIDANT PROTECTION OF POULTRY

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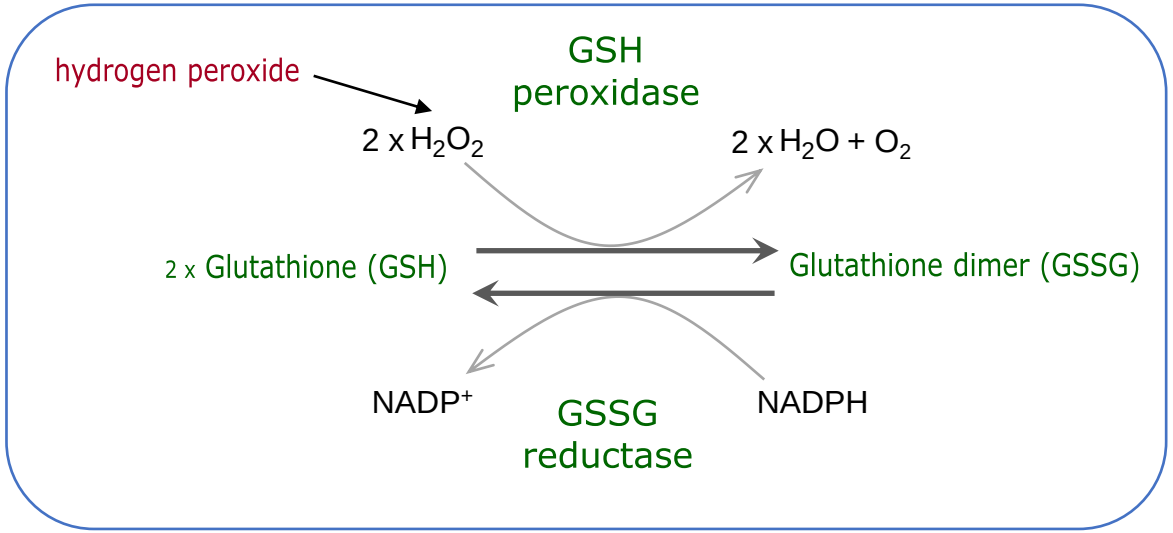
COMPONENTS OF ANTIOXIDANT DEFENSES

TOCOPHEROL SUPPLEMENTATION **150 ppm**

METHIONINE SUPPLEMENTATION **> 0.38 %**

SELENIUM SUPPLEMENTATION



Effects of dietary supplementation of methionine and its hydroxy analog DL-2-hydroxy-4-methylthiobutanoic acid on growth performance, plasma hormone levels, and the redox status of broiler chickens exposed to high temperatures

H. Willemsen,*[1] Q. Swennen,*[2] N. Everaert,* P.-A. Geraert,† Y. Mercier,† A. Stinckens,* E. Decuypere,* and J. Buyse*

3. ANTIOXIDANT PROTECTION OF POULTRY

ANTIOXIDANT STRATEGIES

ANTEMORTEM STRATEGIES

COMPONENTS OF ANTIOXIDANT DEFENSES

TOCOPHEROL SUPPLEMENTATION **150 ppm**

METHIONINE SUPPLEMENTATION **> 0.38 %**

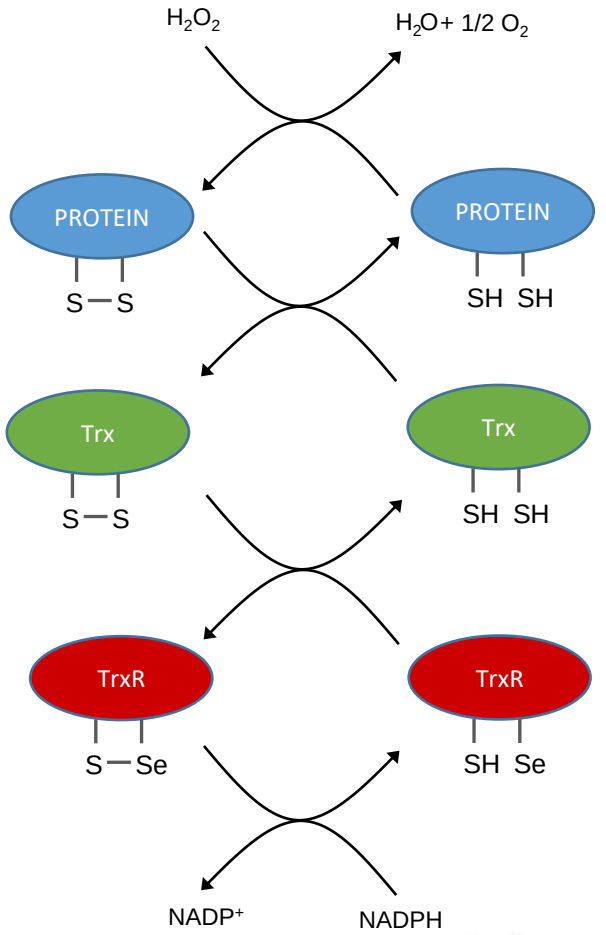
SELENIUM SUPPLEMENTATION **0.03-0.5 ppm**

Biological Trace Element Research (2019) 188:478–484
https://doi.org/10.1007/s12011-018-1430-y

Effects of Different Forms and Levels of Selenomethionine on Productive Performance and Antioxidant Status of Broiler Breeders and Its Offspring

Ruoxi Zhao[1] · Kaixuan Li[1] · Jiangshui Wang[1] · Yongxia Wang[2] · Rujuan Wu[1] · Xiuan Zhan[1]

Selenoprotein Thioredoxin Reductase (TrxR)



3. ANTIOXIDANT PROTECTION OF POULTRY

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MANIPULATION OF ANIMAL FEEDS TO STRENGTHEN THE ENDOGENOUS ANTIOXIDANT DEFENSES

- COMPONENTS OF ANTIOXIDANT DEFENSES
- DIRECT MODULATION OF GENE EXPRESSION
- PHYTOCHEMICALS SUPPLEMENTATION

Open Access
Asian-Australas J Anim Sci
Vol. 32, No. 3:309-319 March 2019
https://doi.org/10.5713/ajas.18.0538
pISSN 1011-2367 eISSN 1976-5517

AJAS
Asian-Australasian Journal of Animal Sciences

Potential crosstalk of oxidative stress and immune response in poultry through phytochemicals — A review

M. T. Lee[1], W. C. Lin[1], and T. T. Lee[1,2,*]

3. ANTIOXIDANT PROTECTION OF POULTRY

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MANIPULATION OF ANIMAL FEEDS TO STRENGTHEN THE ENDOGENOUS ANTIOXIDANT DEFENSES

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DIRECT MODULATION OF GENE EXPRESSION

PHYTOCHEMICALS SUPPLEMENTATION

MAGNESIUM SUPPLEMENTATION

antioxidants

MDPI

Article

Benefits of Magnesium Supplementation to Broiler Subjected to Dietary and Heat Stress: Improved Redox Status, Breast Quality and Decreased Myopathy Incidence

Mario Estevez [1,*] and Massimiliano Petracci [2]

Increases the CATALASE concentration

3. ANTIOXIDANT PROTECTION OF POULTRY

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PHYTOCHEMICALS SUPPLEMENTATION

MAGNESIUM SUPPLEMENTATION

SELENIUM SUPPLEMENTATION

frontiers | Frontiers in Veterinary Science

TYPE Review
PUBLISHED 01 December 2022
DOI 10.3389/fvets.2022.1011159

Check for updates

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Ana Clara Baiao Menezes

Beyond antioxidants: Selenium and skeletal muscle mitochondria

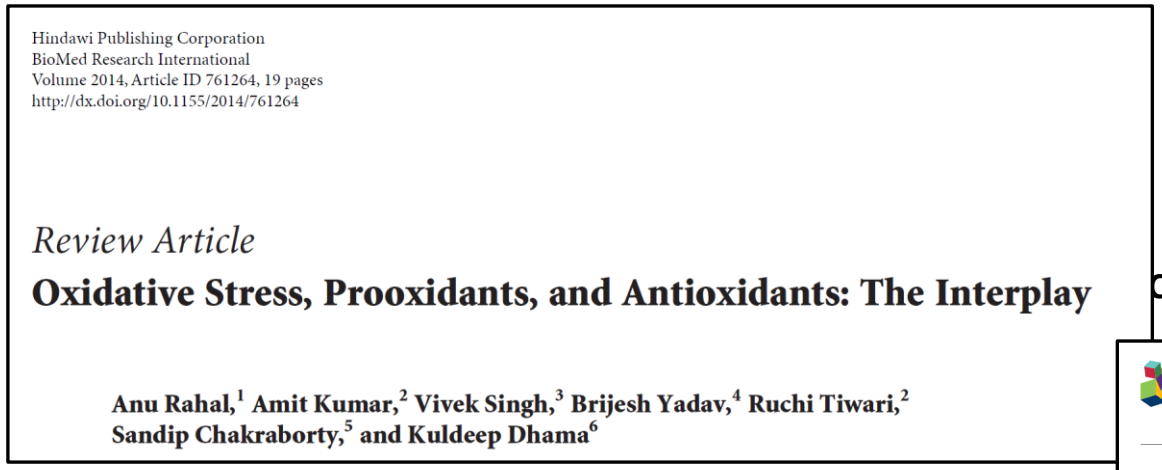
Lauren T. Wesolowski, Pier L. Semanchik and Sarah H. White-Springer*

3. ANTIOXIDANT PROTECTION OF POULTRY

ANTIOXIDANT STRATEGIES

ANTEMORTEM STRATEGIES

MANIPULATION OF ANIMAL FEEDS TO STRENGTHEN THE ENDOGENOUS ANTIOXIDANT DEFENSES



Hindawi Publishing Corporation
BioMed Research International
Volume 2014, Article ID 761264, 19 pages
http://dx.doi.org/10.1155/2014/761264

Review Article

Oxidative Stress, Prooxidants, and Antioxidants: The Interplay

Anu Rahal,[1] Amit Kumar,[2] Vivek Singh,[3] Brijesh Yadav,[4] Ruchi Tiwari,[2] Sandip Chakraborty,[5] and Kuldeep Dhama[6]

VACCINE-LIKE PREVENTION MECHANISM

POLYPHENOLS ARE OXIDIZED

CE LIMITED PROTEIN CARBONYLATION/ROS FORMATION

frontiers in Immunology

REVIEW
published: 04 June 2021
doi: 10.3389/fimmu.2021.698042

Check for updates

Raising the 'Good' Oxidants for Immune Protection

*Alexia Dumas and Ulla G. Knaus**

3. ANTIOXIDANT PROTECTION OF POULTRY

GUT MICROBES
2022, VOL. 14, NO. 1, e2102878 (33 pages)
https://doi.org/10.1080/19490976.2022.2102878

Taylor & Francis
Taylor & Francis Group

REVIEW

OPEN ACCESS Check for updates

Microbiota-derived metabolites as drivers of gut–brain communication

Hany Ahmed [a], Quentin Leyrolle [b], Ville Koistinen [a,c], Olli Kärkkäinen [d], Sophie Layé [e], Nathalie Delzenne [b], and Kati Hanhineva [a,c,f]

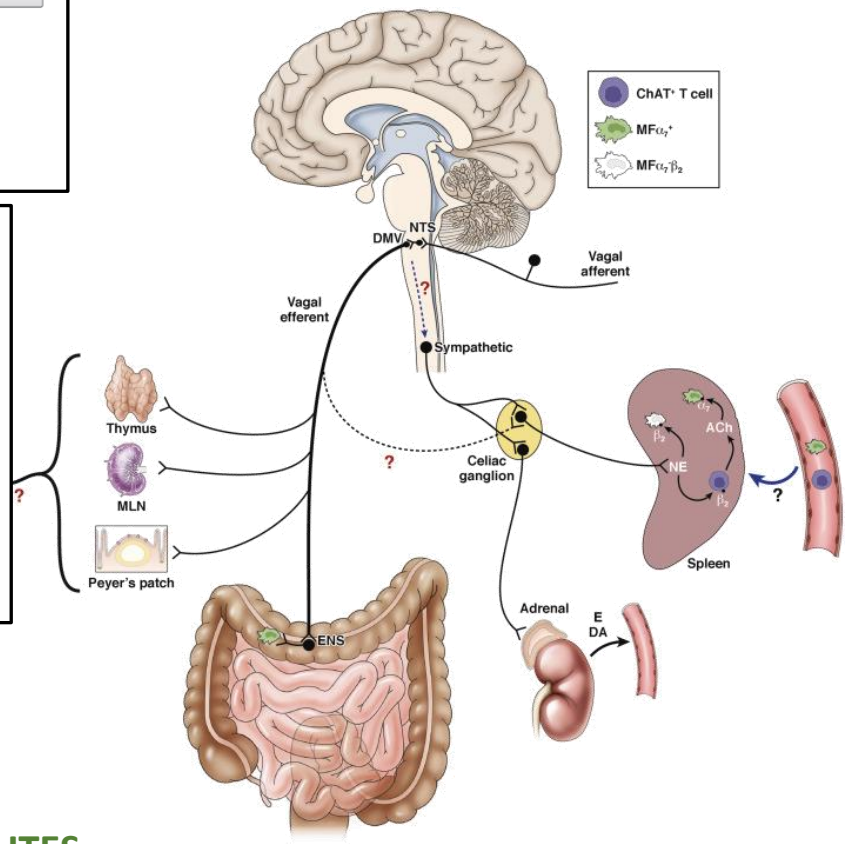
nutrients

MDPI

Review

Regulation of Neurotransmitters by the Gut Microbiota and Effects on Cognition in Neurological Disorders

Yijing Chen [1], Jinying Xu [1,2] and Yu Chen [1,2,3,*]



ACTIVATING THE GUT BRAIN AXIS

PHYTOCHEMICALS SUPPLEMENTATION
PROBIOTICS SUPPLEMENTATION

→ **MICROBIAL METABOLITES** → **VAGUS NERVE**

3. ANTIOXIDANT PROTECTION OF POULTRY

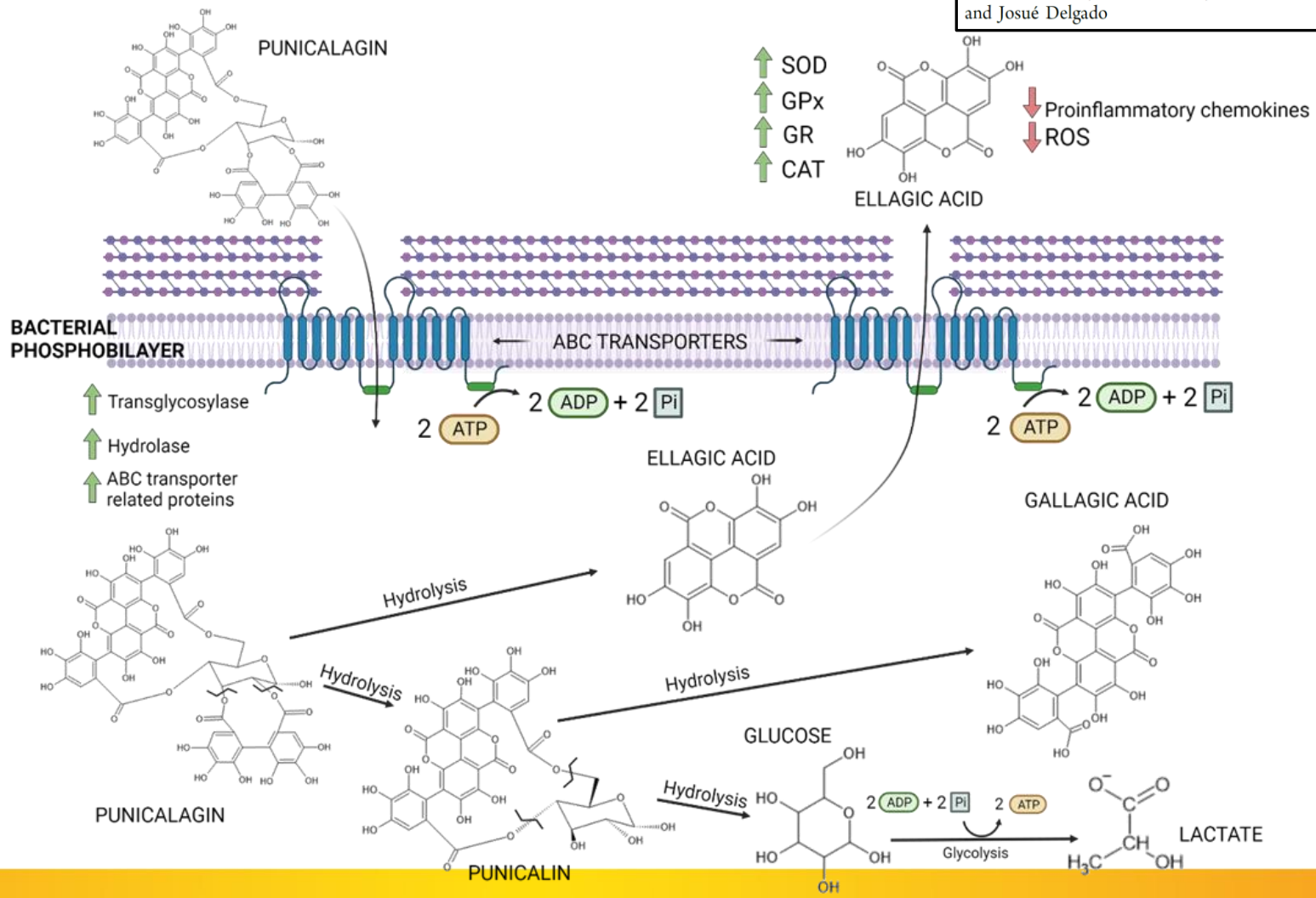
JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

pubs.acs.org/JAFC

Article

Biodegradation of Punicalagin into Ellagic Acid by Selected Probiotic Bacteria: A Study of the Underlying Mechanisms by MS-Based Proteomics

Víctor Caballero, Mario Estévez,* Francisco A. Tomás-Barberán, David Morcuende, Irene Martín, and Josué Delgado



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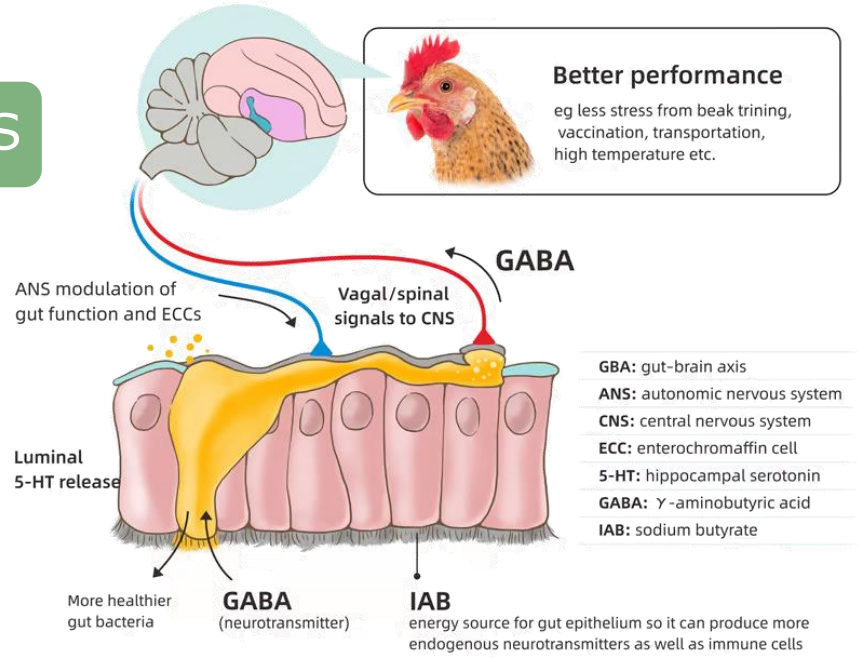
ANTIOXIDANT STRATEGIES

ANTEMORTEM STRATEGIES

- COMPONENTS OF ANTIOXIDANT DEFENSES
- DIRECT MODULATION OF GENE EXPRESSION
- INDUCING MILD PROOXIDANT CONDITIONS
- ACTIVATING THE GUT BRAIN AXIS

PHYTOCHEMICALS SUPPLEMENTATION

PROBIOTICS SUPPLEMENTATION



Beldowska *et al.*
Journal of Animal Science and Biotechnology (2023) 14:37
https://doi.org/10.1186/s40104-023-00853-0

Journal of Animal Science and Biotechnology

REVIEW Open Access

State of the art in research on the gut-liver and gut-brain axis in poultry

Aleksandra Beldowska[1], Marcin Barszcz[2] and Aleksandra Dunislawska[1*]

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RIMINI/ITALY
JUNE 21 - 24

4. FINAL REMARKS

Nutritionist: the final objective – producing desirable meat

CHALLENGE: PROVIDING (POULTRY) MEAT TO A GROWING POPULATION

SUSTAINABILITY

WELFARE

SAFETY

THANK YOU

GRAZIE

GRACIAS

XIE XIE

MERCI

DANKE

KIITOS

OBRIGADO

intaqt

INovative Tools for Assessment and Authentication of chicken meat, beef and dairy products' QualiTies

European Commission
Horizon 2020
European Union funding
for Research & Innovation

Mario Estévez DVM, PhD.
Professor Meat Science & Technology
Universidad de Extremadura, Spain
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