Cairo University
Faculty of Veterinary Medicine
Department of Internal Medicine
and Infectious Disease

Evaluation of Selected Antioxidants as a Complementary Therapy for the Commonly Encountered Skin Diseases of Dogs

Thesis Presented by:

Marwa Rabah Yousif Amer

(B. V.SC., Faculty of Vet. Med, Cairo University, 2009)

For the degree of

M.V.Sc. (Internal medicine)

Under Supervision of

Prof. Dr.Adel Abdelbaset Mohamed Kubesy

Professor of Internal Medicine, Faculty of Veterinary Medicine,
Cairo University

Prof. Dr.Shaymaa Ismaiel Salem
Professor of Clinical pathology,
Faculty of Veterinary Medicine,
Cairo University

Dr. Shimaa Ghanem Yehia Aref
Assistant Professor of Internal Medicine,
Faculty of Veterinary Medicine,
Cairo University

2019

Cairo University
Faculty of veterinary Medicine
Department of medicine and infectious disease

جامعة القاهرة
كلية الطب البيطري
قسم الأمراض الباطنة و المعدية

APPROVAL SHEET

This is an approval that dissertation presented by **Marwa Rabah Yousif Amer** to the faculty of veterinary medicine, Cairo University entitled:

"Evaluation of selected antioxidants as a complementary therapy for the commonly encountered skin diseases of dogs"

For the Master Degree in Veterinary Medicine (internal medicine) has been approved by the examining committee:

Prof. Dr.Mohamed Samir Hassan
Professor of Internal Medicine
Faculty of Veterinary Medicine
Beni-Suef University

Prof. Dr.Taher Ahmed Mahmoud Baraka
Professor of Internal Medicine
Faculty of Veterinary Medicine
Cairo University

Prof. Dr.Adel Abdelbaset Mohamed Kubesy
Professor of Internal Medicine
Faculty of Veterinary Medicine
Cairo University

Prof. Dr.Shaymaa Ismaiel Salem
Professor of Clinical pathology
Faculty of Veterinary Medicine
Cairo University

Dr. Shimaa Ghanem Yehia Aref
Assistant Professor of Internal Medicine
Faculty of Veterinary Medicine
Cairo University

Date:25/12/**2019**

Cairo University
Faculty of Veterinary Medicine
Department of Internal Medicine and
Infectious Disease

This Thesis is under Supervision of:

Prof. Dr.Adel Abdelbaset Mohamed Kubesy

Professor of Internal Medicine

Faculty of Veterinary Medicine

Cairo University

Prof. Dr.Shaymaa Ismaiel Salem

Professor of Clinical pathology

Faculty of Veterinary Medicine

Cairo University

Dr. Shimaa Ghanem Yehia Aref

Assistant Professor of Internal Medicine

Faculty of Veterinary Medicine

Cairo University

Cairo University
Faculty of veterinary medicine
Department of Internal Medicine and
Infectious Disease

Name : Marwa Rabah Yousif Amer
Nationality: Egyptian
Date of birth: 20/7/1987
Place of birth: Monofiya
Specialization: Internal Medicine

Title of M.V.Sc thesis: Evaluation of Selected Antioxidants as a Complementary Therapy for the Commonly Encountered Skin Diseases of Dogs

ABSTRACT

Dermatological problems are one of the most commonly reported disorders encountered in small animal medicine .This current investigation was carried out on 60 selected dogs divided into five groups; apparently healthy group (11 dogs), pyoderma diseased group (10 dogs), dermatophytosis affected group (13 dogs) , mange diseased group (8 dogs) and tick and flea allergic dermatitis diseased group (18 dogs) to evaluate hematobiochemical parameters and oxidative stress biomarkers in diseased dogs when compared with apparently healthy dogs and to investigate the therapeutic effect of antioxidants supplements (vitamin A and vitamin C for dermatophytosis , zinc for pyoderma vitamin E and selenium for mange and allergic dermatitis) as complementary to the standard therapy . Blood, stool and skin samples were collected from all dogs and were analyzed before and after treatment for fungal investigation of hair shaft and skin, hematological examinations, oxidative stress biomarkers

investigations (Superoxide dismutase “SOD”,Glutathione peroxidase “GPX”, Catalase enzyme “CAT” Malondialdehyde “MDA”), complete blood picture ,liver and kidney functions tests (ALT, AST, urea and creatinine).In mange group, there was leukocytosis, neutrophilia, significant increase in SOD and MDA and significant decrease in catalase and GPX while after treatment SOD was significantly decreased in antioxidant supplemented therapy , MDA was significantly decreased after classic and antioxidant supplemented treatment and catalase was significantly increased after classic and antioxidant supplemented therapy. In allergic dermatitis, there was thrombocytopenia, leukocytosis, high ALT and AST, low GPX and high MDA while after treatment GPX and catalase were significantly increased in antioxidant supplemented treatment. In pyoderma there was thrombocytopenia, neutrophilia, high ALT, AST, BUN, low GPX and catalase and high MDA but after treatment catalase was significantly raised. In dermatophytosis, there was eosinophilia, high ALT, AST, SOD and MDA but low GPX while after antioxidant supplemented therapy SOD was significantly decreased and GPX and catalase were statistically increased.

Key words: pyoderma, dermatophytosis, dermatitis, mange, scabies, ROS, antioxidants, Canine.

Acknowledgement

Thank Allah who has given me good health, knowledge, strength, perseverance needed to finish my Thesis.

I would like to express my sincere gratitude to my advisors Prof. Dr. Adel Abdelbaset, Prof Dr. Shaymaa Ismaiel Salem and Dr. Shimaa Ghanem for their continuous support, patience, motivation, for their insightful comments, encouragement, and immense knowledge. Their guidance helped me in all the time of research and writing of this thesis. I would like also to thank prof dr Abdel Bary, department of biochemistry, Faculty of Veterinary Medicine, Cairo University who gave the facilities at his private lab to keep the specimens of the thesis work in liquid nitrogen freezer. Also I would like to thank Dr. Rania Galal, assistant lecturer, Faculty of Dentistry, Badr University for fruitful help in statistical analysis of my study results.

I would like to express my very profound gratitude to my family who has been my constant source of love, support, inspiration and strength all these years.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ABBREVIATIONS

ALP	Alkaline phosphatase
ALT	Alanine aminotransferase
AST	Aspartate transaminase
BUN	Blood urea nitrogen
CAT	Catalase
CGD	Canine generalized demodicosis
FBH	Flea bite hypersensitivity
FAD	Flea allergic dermatitis
GGT	Gamma-glutamyltransferase
GPX	Glutathione peroxidase
H2O2	Hydrogen peroxide
HCA	hydrocortisone aceponate
HIF	Hypoxia induced factors
KOH	Potassium hydroxide
MDA	Malondialdehyde
MT	Metallothionein
NADPH	Nicotinamide adinine dinucleotide phosphate
NOS	Nitric oxide synthases
ROS	Reactive oxygen species
SOD	Superoxide dismutase
TLC	Total leukocytic count
TrXR1	Thioredoxin reductases

Chapter (1)

Introduction

Chapter (1)

Introduction

The coat and skin are the most immediate and visual way to assess the general health of an animal. The skin, the largest organ in the body, and coat provide a protective layer between the environment and the rest of the body **Paterson (2008).**

Skin serves many purposes and on the trunk, or body, skin is generally thickest dorsally with a decrease in thickness ventrally. On the limbs, the skin is thickest proximally and decreases distally except for specialized areas like the footpads. Skin is thickest on the forehead, dorsal neck, thorax, rump, and base of the tail. Skin is thinnest on the ears, axillary, inguinal, and perianal areas. In dogs, skin thickness ranges from 2.6 to 5.2 mm. Breed and gender both affect skin thickness in dogs. The pH of dog skin is generally more basic than that of cat skin, ranging from 5.5 to 8.8 **Wang et al., (2016).**

Dog skin disorders are among the most common health problems in dogs. The condition of dog's skin and coat can also be an important indicator of its general health. Skin disorders of dogs vary from acute, self-limiting problems to chronic or long-lasting problems requiring life-time treatment. They also need to be differentiated on the basis of being of primary or secondary (due to scratching, itch) in nature, making diagnosis complicated **Paterson (2008).**

Skin is a major target of oxidative stress due to reactive oxygen species (ROS) that originate in the environment and in the skin itself. ROS are generated during normal metabolism, are an integral part of normal cellular function, and are usually of little harm because of intracellular mechanisms that reduce their damaging effects. Antioxidants attenuate the damaging effects of ROS and can impair and/or reverse many of the events that contribute to epidermal toxicity and disease. However, increased or prolonged free radical action can overwhelm ROS defense mechanisms, contributing to the development of cutaneous diseases and disorders. Although ROS play a role in diseases such as skin cancer, their biological targets and pathogenic mode of action are still not fully understood. In addition, strategies useful in the therapeutic management of ROS action in human skin are still lacking **(Wang et al., 2016).**

The cells contain a variety of antioxidants mechanisms that play a central role in the protection against reactive oxygen species. Antioxidants may act by scavenging the radicals directly and sustaining the activity of antioxidant enzymes or inhibiting the activity of oxidizing enzymes **(Snezhkina et al., 2019).**

A number of environmental factors (e.g., UV radiation, tobacco smoke) as well as an activation of superficial receptors of the cell may contribute to the increased production of ROS in those organisms. In normal cells, permanently produced oxygen derivatives are neutralized or eliminated due to the presence of a

natural defensive mechanism that involves enzymatic antioxidants (glutathione peroxidases, superoxide dismutase, catalase) water or fat soluble non-enzymatic antioxidants (vitamins C and E, glutathione, selenium) **(Paterson, 2008).**

Aim of work

- ✓ Diagnosis of the commonly encountered skin diseases of dogs.
- ✓ Studying the altered oxidative stress biomarkers and hematobiochemical parameters in associations with the diagnosed skin disease.
- ✓ Evaluation of therapeutic responses of diagnosed skin diseases to standard treatment with and without antioxidants therapy (zinc for pyoderma, vitamin A and vitamin C for dermatophytosis and vitamin E for parasitic skin diseases).
- ✓ Assessment of the altered oxidative stress biomarkers associated with diagnosed skin diseases before and after treatment.