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Immunological studies on camels *(Camelus dromedarius)* in Egypt

A Thesis

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For the degree of

Ph.D. in Veterinary Medical Sciences

Microbiology

(Bacteriology, Immunology and Mycology)

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2015

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Key words: Camel, *Camelus dromedarius*, Immunoglobulin G, HRP

Abstract

As the labeled anti-camel Igs with enzymes for ELISA are unavailable in commercial level, the present investigation was directed for developing labeled anti-camel IgG with horseradish peroxidase. For purification of camel IgG whole molecule, camel sera were preliminary precipitated with 50% saturated ammonium sulphate and dialyzed against diluted PBS then concentrated. This preparation was followed by Protein A Sepharose affinity column chromatograhy for purification of camel IgG. The purity of the eluted camel IgG was tested by SDS-PAGE. Four bands of molecular weight 63, 52, 40 and 33 kDa, represent camel IgG, were detected. Anti-camel IgG was prepared by immunization of goats and rabbits separately, with purified camel IgG. Then anti-camel IgG was purified by loading on Protein A Sepharose affinity column chromatography after precipitation and concentration. Whole molecule anti-camel IgG was conjugated with horseradish peroxidase. The obtained results showed that in fact glutraldehyde was effective and suitable reagent for producing protein-enzyme complexes that retained a part of their enzymatic and immunological specificity. Sensitivity of prepared conjugated secondary antibodies was detected using positive camel serum samples reacted with different antigens in ELISA compared with Protein A horseradish peroxidase. The recorded sensitivity is 100%. The specificity of the prepared conjugates was determined using negative serum samples in ELISA. The specificity is also 100% compared to 58-75% of protein A horseradish peroxidase. The conjugates are stable for one year at -20ºC as proved by ELISA. Collectively, the current study introduces goat and rabbit anti-camel IgG whole molecules with simple, inexpensive method, with 100% sensitivity, 100% specificity and stability up to one year at -20ºC. The important facet of the current study is saving hard currency. Future investigations are necessary for preparation of IgG subclasses.

"وَعَلَمَكَ مَا لَمْ تَكُن تَعْلَمُ وَكَانَ فَضْلُ ٱللهِ عَلَيْكَ عَظِيمًا"

سورة النساء / الآية - 113

DEDICATION

To my father, my mother, my wife, my sons (Mohamed & Abdel Rhman), my brothers and my sister

Whom I am indebted to them for my happiness in my life.

Thanks

Ehab

Acknowledgment

First of all, I would like to express my prayerful gratitude and great thanks to The Merciful **ALLAH** whose help I always seek, and without his will, I shall achieve nothing.

My sincere thanks and gratitude for the kindness of spirit of **Prof. Dr. / Mahmoud Essam Hatem Ahmed,** Professor of Microbiology, Faculty of Veterinary Medicine, Cairo University**,** for his stimulating supervision, heartily encouragement, great help, support, criticism and valuable discussion during the course of present work.

It is great pleasure to record my great thanks to **Prof. Dr. / Jakeen Kamal Abdel-Halem El-Jakee,** Professor of Microbiology, Faculty of Veterinary Medicine, Cairo University, for her stimulating, helpful supervision, cooperation and valuable encouragement.

I am deeply grateful to **Prof. Dr. / Nagwa Sayed Sayed Ata,** Professor of Microbiology, National Research Centre, for her supervision and encouragement in this work.

I would like to express my deep appreciation and sincere thanks to **Prof. Dr. / Eman Hussein Abel-Rhman,** Professor of parasitology and immunology, National Research Centre, for her stimulating supervision, cooperation and supplying facilities required for the practical work, kind guidance, valuable help and continuous interest and advice. No words enough to explain her effort to help me to be researcher.

It is great pleasure to record my deep and great thanks to all members of Microbiology and Immunology Department as well as Department of Parasitology and Animal diseases, National Research Centre for valuable help and advices during the work.

List of abbreviations

Ab	antibody
Abs	antibodies
Ag	antigen
AGID	agargel immunodiffusion
BoNT/A	Botulinum complex toxoid A
BSA	bovine serum albumin
CC	Constant chain
CH_1, CH_2, CH_3	first,second and third constant domain of H-chain
ELISA	Enzyme linked immunosorbent assay
Fig.	Figure
g	gram
HC	heavy chain
HCAbs	heavy chain antibodies
HRP	horseradish peroxidase
IEP	immuno-electrophoresis
IEX	ion-exchange
Igs	immunoglobulins
IgG	immunoglobulin G
kDa	kilo daltons
KLH	Keyholl limpet hemocyanin
LC	light chain
min	Minutes
ml	Militer
mM	millimolar
µg	Microgram
NAbs	Natural antibodies
No.	Number
NSS	Normal saline solution
PBS	Phosphate buffered saline
PBST	Phosphate buffered saline Tween 20
Photo.	Photograph
%	Percentage
RT	Room temperature
SDS-PAGE	Sodium dodecyl sulphate-polyacrylamide gel electrophoresis
Spp.	Species
VC	variable chain
VH	Variable domain of H-chain
VHH	Variable domain of H-chain

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1. Introduction

The camel occupies a unique position among animals which man has failed to exploit adequately and undoubtedly have unexplored and unrealized potential. Although the camel is neglected by science, largely ignored in technical literature, unappreciated and even unfavorable in the countries which makes its greatest contribution. Arabian camels have been domesticated for approximately 1500 years BC and have been long valued as pack animals **David (2006)**. From a global perspective, the economic significance of camel production is minimal in comparison with that of other domestic animals so that camels breeding could be done to overcome Egyptian's needs for animal protein and its by-products. Certain breeds of camel can live in more humid environments the main breed is the dromedary of the Nile Delta of Egypt **(Nawito *et al.*, 1967**). Dromedaries form an integral part of the desert environment, where their ability to survive and produce milk, meat, fibre and provide transport for nomadic peoples is unique (**Azwai *et al.*, 1995a**). The camel plays such an important role in Arab culture that there are over 160 words for camel in the Arabic language. There were 11.24 million camels in the Arab world which represent 61% of camel numbers in the world (**Farid, 1990**) and 15% of the total number of animal species. The amount of meat and milk produced from camels is 289.2 and 213 thousand tons, respectively (**Wardeh, 1990**). **Hamam (1993)** reported that the camel represents a national wealth and source of income to the majority of citizens particularly in desert areas. Improvement of camel breeds production and health would preserve the recent increasing demand for camel meat and milk of distinguished quality (**Wernery and Kaaden,**

1995). **Elagamy *et al.* (1996**) refer to camel's milk is an important component of the diet of certain Arabian peoples. It has been noted that despite the lack of refrigeration, camel's milk remains unspoiled for several days: this may be due to the antibacterial activity of certain minor proteins contained in camel's milk. Camels are used for military uses as well as freight animals instead of horses and mules. In World War I, the British Army also created the Egyptian Camel Transport Corps, which consisted of a group of Egyptian camel drivers and their camels. The Corps supported British war operations in Sinai, Palestine, and Syria by transporting supplies to the troops **(David, 2006).**

The distribution and economic potential of camels according to **FAOSTAT (2001)** are about 19 million camels in the world, of which 15 million are found in Africa and 4 million in Asia. Of this estimated world population, 17 million are believed to be one-humped dromedary camels (*Camelus dromedarius*) and 2 millions two-humped (*Camelus bactrianus*). Approximately 11 million dromedaries, representing two thirds of the world's camel population, are in the arid areas of Africa, particularly in North East Africa, i.e. Somalia, Sudan, Ethiopia and Kenya.

Table (1): Estimated camel populations of Africa and the world **(FAOSTAT, 2001)**

Country	**Camel population (x 10^3)**	**Country**	**Camel population (x 10^3)**
Algeria	240	Egypt	120
Morocco	36	Ethiopia	1070
Chad	725	Somalia	6200
Niger	415	Kenya	830
Djibouti	70	Sudan	3200