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

A Thesis

Presented by

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### 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 chromatography 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 glutaraldehyde 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 -20°C 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 -20°C. The important facet of the current study is saving hard currency. Future investigations are necessary for preparation of IgG subclasses.



"وَعَلَّمَكَ مَا لَمْ تَكُن تَعْلَمُ وَكَانَ فَضْلُ اللَّهِ 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*

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## 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 <sub>1</sub> , CH <sub>2</sub> , CH <sub>3</sub> | 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 <sup>3</sup> ) | Country  | Camel population (x 10 <sup>3</sup> ) |
|----------|---------------------------------------|----------|---------------------------------------|
| Algeria  | 240                                   | Egypt    | 120                                   |
| Morocco  | 36                                    | Ethiopia | 1070                                  |
| Chad     | 725                                   | Somalia  | 6200                                  |
| Niger    | 415                                   | Kenya    | 830                                   |
| Djibouti | 70                                    | Sudan    | 3200                                  |