LIST OF CONTENTS

Chapter **Page**

LIST OF ERRATA

Page	Paragraph	Line	False	Right
26	1	2	or	of
30	6	1	OPD	Orhtopheylene diamine (OPD)
32	2	2	diluted…well.	cancelled
33	2	1	techniques	technique
40	3	1	difference	difference between
40	3	2	animals contact	animals
69	2	1	anit-FMDV	anti-FMDV

LIST OF ABBREVIATION

Ab	**:**	Antibody
AHRI	**:**	Animal Health Research Institute
BHK	**:**	Baby hamster kidney
BTY	**:**	Bovine thyroid cells
CFT	**:**	Complement Fixation Test
cDNA	**:**	Complementary DNA
CPE	**:**	Cytopathic effect
CTL	**:**	Cytotoxic T lymphcytes
d.p.v	**:**	Days post vaccination
DDW	**:**	Double Distilled Water
DI	**:**	Defective interfering
DMEM	**:**	Dublecco's Modified Eogle Medium
DVSVRI	**:**	Department Veterinary Serum and Vaccine Research Institute
ELISA	**:**	Enzyme Linked Immunosorben Assay
EU	**:**	European Union
FMD	**:**	Foot-and-Mouth Disease
FMDV	**:**	Foot-and-Mouth Disease Virus
HIPH	**:**	High Institute of Public Health
IB-RS-2	**:**	The big kidney cell line
IFNs	**:**	Interferons
IP	**:**	Intraperitoneal
IU	**:**	International Unit
IVB	**:**	International Vaccine Bank
kb	**:**	kilo base
Lp ELIZA	**:**	Liquid-phase blocking sandwich ELISA
MEM	**:**	Modified Eogle's Medium
MHCI	**:**	Major histocompatability class-I
MHCII	**:**	Major histocompatability class-II
MLV	**:**	Modified live virus
NSPs	**:**	Non-structural protein
NVDL	**:**	National Veterinary Disease Laboratory
OIE	**:**	Office International des Epizootic (World Animal Health Organization)
OPD	**:**	Orthopheylene diamine
ORP	**:**	Open Reading Frame
PBMC	**:**	Peripheral Blood Mononuclear Cells
PBS	**:**	Phosphate buffer saline

PCR	**:**	Polymerase Chain Reaction
PD	**:**	Proportionate distance
RGD	**:**	Arginine-Glycine-Aspartic acid
RT/PCR	**:**	Reverse Transcriptase Polymerase Chain Reaction
SAT	**:**	South African Territories
SNT	**:**	Serum Neutralization Test
Sph ELISA	**:**	Solid phase ELISA
T20	**:**	Tween 20
$TCTD_{50}$	**:**	50 percent of the inoculated culture give cytopathic effect
UK	**:**	United Kingdom
USA	**:**	United State of America
VPI	**:**	Structural protein I
VSVRI	**:**	Veterinary serum and Vaccine Research Institute
WRLB	**:**	World Reference Laboratory Birbright

SUMMARY AND CONCLUSION

FMD, one of the most important animal diseases, still represents a major worldwide concern. The disease is caused by FMDV which is the sole member of aphthovirus genus of *Picornaviridae* family. FMD is an acute disease of all cloven footed animals characterised by rapid spread where it is the most contagious disease known to the humanity.

The virus spreads via aerosol by contact with infected animal or human because it can persist in the oropharangel region up to 30 month and in the nasal passage up to 28 hours in animal and human, respectively.

FMDVs provide examples of extreme acid sensitivity as they are abruptly inactivated by minute increases in acidity below pH 6.0. They can persist in contaminated fodder and the environment for up to 1 month, depending on the temperature and pH conditions. The most important features of the epidemiology of the disease are the rapid growth of the virus, its stability under a variety of conditions and existence of asymptomatic carriers.

As the virus is known to be present in breath, saliva, faeces, urine, milk and semen for up to four days before clinical signs and may remain viable for up to 2 days at 37°C, transmission is through direct or indirect contact (droplets), animate vectors (humans, ect.), inanimate vectors (vehicles, implements) and airborne, specially temprate zones.

FMD is endemic in Africa, parts of South America, in most of Asian countries and the middle East and in free areas there are sporadic outbreaks. Devastating outbreaks such as those suffered by the United Kingdom in 2001, have cost economies in ways not only limited to the live stock industry but also in tourism and travel.

In humans, the disease is characterized by fever, salivation and vesiculation of mucous membranes of the oropharynx and skin of the palms, soles, fingers and toes.

In animal the disease is characterized by blisters in mouth, specially on tongue, on feet and teets, occasionally on the nose in pigs and on the coronary bands of hoofs. This leads to lamnes, pyrexia, anorexia and weight loss. Mastitis may be a sequel resulting in stopping of milk secretion.

There is frequently secondary bacterial infection of the lesions resulting in further deterioration. FMDV may localize in heart of young animals resulting in myocarditis which is usually fatal. Some damage to the pancrease and other glandular tissues has been reported in cattle and other species.

FMDV viral structural proteins have many critical determinants for infection and immunity inherent in the molecular constituents of the VP1 protein. The “empty capsid” is capable of inducing antibody responses at similar level to that induced by the whole virus. Five sites containing B-cell epitopes were defined on the structural proteins of FMDV, four B-cell epitopes and single T-Cell epitope (VPI).

The importance of neutralizing antibodies in FMDV infection is well known and the vaccine (consisting of inactivated purified virus) induced production of neutralizing antibodies. However the duration of protection, the neutralizing antibody titre and the average affinity of vaccine-induced responses are lower than those following natural infection.

Laboratory investigations are essential for rapid and accurate diagnosis. The laboratory procedures for identifying typing and detecting of FMDV and viral antibodies are based on: PCR test, ELISA test, CFT, neutralization tests and virus isolation.

Two approaches are used to control the disease, the first of these is employed usually by the disease free countries such as United kingdom and developed countries. The first approach is based upon rapid, slaughtering of affected herds (stamping out), along with movement restriction. The second approach is vaccination which is used widely by countries in which the disease is endemic as Southern America, Middle East and South African Territories.

Up to date the prophylaxis vaccination with chemically inactivated whole FMDV is a major means to prevent and control this disease in most developing countries.

Chemically inactivated whole FMD virus vaccine usually elicits high levels of neutralizing antibodies and protection against the homologous viruses. However there is a need for periodic revaccination with virus strains antigenically related to circulating viruses.

The present study aimed to:

1- Study the use of different immunological methods in assessment of the immune response to FMDV in humans, farm and experimental animals.
2- Study the immune response elicited in experimental animals to infectious and inactivated FMDV.
3- Assess the immune status to FMDV in humans and farm animals in different Egyptian governorates.

This study was carried out during the period from 2005-2006 in AHRI Cairo and Sohag, BBMRI and HIPH in Alexandria, including human, farm animals (cattle) and experimental animals (mice), using ELISA, CF and SN testes.

Human

One hundred persons from Sohag and El-behera Governorates were divided into two groups: Group I included persons in contact with the susceptible livestock and meat products including veterinary doctors, farmers, butchers and meat processors. Group II included persons not in contact with animals and their products.

Farm animals (cattle)

A total of 386 healthy cattle were recruited randomly from different governmental and private farms in Sohag and El-behera Governorates. One group was vaccinated once, another group vaccinated twice and the third group had four vaccine doses.

Experimental animals (mice)

A total of 150 mice were included in the experimental study. They were obtained from VSVRI. Mice were in three groups. Group (1) was inoculated with infectious FMDV. Group (2) was inoculated with inactivated FMDV (vaccine) subtype O1/93 and Group (3) was a control group.

The results were:

- In Sohag, 26% of screened healthy persons had protective anti-FMD antibody. Anti-FMD was found in 85.7% of people in contact with the animals and their products.
- The percentages of males and females having anti-FMD antibody in Sohag were 23.8% and 22.6%, respectively. In El-Behera the percentages were 2.9% and 41.7 in males and females, respectively.
- In Sohag 125 cattle out of 200 (62.5%) and in El-Behera 130 out of 186 cattle (69.9%) had protective anti-FMD antibody.
- In Governmental farms the percentages of cattle having protective anti-FMDV antibody were 66.7% and 74% in Sohag and El-Behera, respectively, while in the private farms the percentages were 57.9% and 65.1%.
- In El-Behera Governorate anti-FMDV was positive in 16% of healthy persons and in 40% in these in contact with animals.
- In Sohag the percentages of cattle having anti-FMDV antibody which received one vaccine dose and those which received 4 vaccine doses were 40% and 93.3%, respectively. In El-Behera the percentages were 27.8% and 86.7% in those receiving one and 4 vaccine doses, respectively.
- The percentages of cattle in Sohag having anti-FMDV antibody in relation to days post vaccination were 60%, 100% and 26.7% at the periods (0-60), (60-120) and (120-180) days post vaccination, respectively. In El-Behera the percentages were 83.3%, 100% and 33.3% at the periods (0-60), (60-120) and (120-180) respectively.
- Mice infected with live FMDV elicited higher anti-FMDV antibody titres than those vaccinated with inactivated FMDV.
- Mice which received two-fold dose(s) of FMDV either live or inactivated virus showed higher anti-FMDV antibody titres than those which received one-fold dose(s).
- Mice received three doses of FMDV either live or inactivated virus showed higher anti-FMDV antibody titres than those which received one dose.
- The highest anti-FMDV antibody titres were obtained by ELISA technique.

Conclusion

1- Antibodies to FMDV were significantly higher among persons in contact with animals or their products.

2- Animals recruited from governmental farms had a higher percentage of positivity to anti-FMDV antibodies.

3- Anti-FMDV antibodies were detected at a significantly higher rate among cattle receiving 4 vaccine doses.

4- All animals sampled at 60-120 days post vaccination had anti-FMDV antibodies while a marked decline in the antibody positivity rate was observed in samples obtained 120-180 days post vaccination.

5- In mice, live FMDV yielded higher anti-FMDV antibodies titres than the killed FMDV (vaccine). The anti-FMDV antibodies titres were higher in mice receiving either two or three doses than in those receiving one dose.

6- Higher anti-FMDV titres were recoverd by the ELISA techniques.

RECOMMENDATIONS

1- Encouraging owners of private farms to comply to vaccination of their cattle.

2- As anti-FMDV positivity declined markedly 120-180 days post vaccination; duration between vaccine doses should be shorter than 120 days instead of that applied after 6 months.

3- Studies testing the use of vaccines containing live FMDV on cattle should be carried out in order to replace the already used killed virus vaccine for better vaccine efficacy.

4- It should be emphasized that the use of ELISA technique for determination of anti-FMDV antibody is crucial for a sound epidemiological surveillance of herd immune status.