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STUDIES ON RELATION BETWEEN PSEUDOTUBERCLOSIS AND PRODUCTIVE PERFORMANCE OF SHEEP AND GOATS

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ABSTRACT

A total of 400 sheep and 400 goats, 3-4 years old were examined for corynebacterium pseudotuberculosis infection in Animal Production Research, ARC, MOA, Egypt farms. For experiment, 8 pregnant sheep and 8 pregnant goats were vaccinated by 0.1 ml B.C.G as a first dose after one month of pregnancy. Three months later a second dose of B. C. G vaccine injected. Group 2 included 4 pregnant sheep and 4 pregnant goats which kept as control. The antibody levels detected by Elisa test, at parturition and for three successive months for pregnant mothers and for newly born lambs and kids. The milk yield and milk composition measured for the vaccinated dams and control one. The weight of lambs and kids recorded at birth and for three successive months after birth. Corynebacterium pseudotuberculosis was isolated with a percentage of 3 and 4 % from sheep and goats, respectively. Results show a significant increase in antibody level in vaccinated sheep and goats than non-vaccinated ones, with a slight more intensity in vaccinated goats than sheep. There was increase in the humeral immunity in lambs and kids born from vaccinated dams than non-vaccinated ones. In addition, a significant increase noticed in milk yield with decrease in percentages of fat, protein, lactose, total solids and solids not fat in vaccinated group than non-vaccinated. Body weight of newborn lambs and kids were heavier for vaccinated groups than control. It could recommend the use of BCG vaccine in sheep and goats to increase the immunity level against corynebacterium pseudotuberculosis and to improve productive performance.

INTRODUCTION

Corynebacterium pseudotuberculosis is the pathogen of different diseases in different animals. It is classified into two biovars and two serotypes depending on nitrate reduction, guinea pig pathogenicity and serological tests; serotype 1 (biovar I) and serotype II (Biovar 2) (Barakat et al., 1984) Biovars I and II are the ethiological agents of a disease that is commonly called caseous lymphadentis (CLA). The disease found in the entire world's among sheep and goats areas, causing significant economic losses (Paton, et al. 2003). Type 2 cause ulcerative lymphangitis (Brumbaugh and Ekman, 1981) and in Egyptian buffaloes it cause oedematous skin disease, Caseous lymphadentis (CLA) which is chronic, granulomatous disease caused by gram-positive bacterium Corynebacterium pseudotuberculosis. The most common mode of entry of Corynebacterium pseudotuberculosis into the host believed to be via skin wounds or by aerosol infection of lungs (Paton, 1993). Consequently, CLA characterized primarily by formation of abscesses within the superficial lymph nodes, in addition to draining the lung (Batey, 1986 and Paton, 1993). CLA is a major disease among Australian sheep. For example, the average prevalence in Western Australian flocks is 45% and the overall cost of CLA to the Australian sheep industry estimated by 10 to 15 million Australian dollars due to losses in wool production and 10 million Australian dollars for the inspection and subsequent trimming of abscesses from carcasses, particularly in exported abattoirs (Paton, 1993 and Paton et al., 1988). Therapeutic treatment of the disease is not effective, as the pathogen has an intracellular location, and the distribution of drugs inside the granuloma is poor. The puncture of the peripheral affected lymph nodes is the only viable treatment,

but it can cause the spread of bacteria in the environment, therefore elevating the risk of contamination (Nairn and Robertson, 1974).

The internal granulomas are difficult to diagnose and may be a source of contamination for other animals (Ellis et al., 1987). Control programs have traditionally involved detection and lancing of abscesses and isolation of infected animals, disinfection of contaminated shears, docking equipment and dipping fluid and calling of animals with recurring abscesses. This method of control has not proven satisfaction due to long-term survival of the bacteria in the environment, shedding of bacteria in large numbers from ruptured abscesses and presence of undetectable internal abscesses which may be a source of new infection (Monzies et al., 1991 and Baird and Fontaline, 2007).

Several experimental trials have developed in order to achieve a reliable vaccine to control the disease in sheep and goats. Different antigen preparations have been employed, such as formalin-killed bacterin, bacterial cellular wall and phospholipase D toxoid (Cameron et al., 1972; Brogden et al., 1984, 1996 ; Brown et al., 1986 ; Eggleton, 1991). An association of bacteria and formalin inactivated exotoxin was also tested, resulting in partial immunity characterized by fever affected lymph nodes in each animal and fewer animal presenting with disease (Piontko Wski and Shivvers, 1998).

In Egypt, it used to vaccinate sheep with Bacillus Calmette and Guerin (BCG) against Corynebacterium pseudotuberculosis (Osman et al., 2008). In present study, we used BCG at non-specific vaccine for controlling CLA in sheep and goats.

MATERIAL AND METHODS

Animals

A flock of 400 sheep and goats known to be infected with Corynebacterium pseudotuberculosis and had a recognized problem with CLA

Experimental animals:

The experimental work of this study was carried out at Sakha Experimental Station (Kafer El-Sheikh Governorate), belonging to Animal Production Research Institute, Agricultural Research Center, Egypt. Twelve pregnant Finnish landrace sheep and twelve pregnant Zaraibi goats, 3-4 years old were selected for the study (of each, 8 vaccinated and 4 kept non vaccinated. Twelve pregnant Finnish landrace sheep and twelve pregnant Zaraibi goats, 3-4 years old were selected for the study (of each, 8 vaccinated and 4 kept non vaccinated)

Lambs & kids

8 lambs and 8 kids born from vaccinated dams and 4 lambs and 4 kids born from non-vaccinated dams were involved in the study

Ewes and does kept under similar management condition and housed in shaded pens. Water and minerals salt were permanently available.

Experimental design

Twelve pregnant sheep and goats divided into group 1 (treated) and group 2 as control

Group 1 vaccinated with 0.1 ml BCG vaccine after one month of pregnancy as a first dose and the second dose was after three month of first one.

Serum samples were collected from the vaccinated and non-vaccinated groups at birth and for 3, successive months respectively, where the humeral immunity measured by Elisa test.

Blood samples were collected for detection of humeral immune response at birth and for three successive months after birth in lambs and kids born from vaccinated and non vaccinated pregnant mothers.

BCG vaccine supplied by Veterinary Serum and Vaccine Research Institute, Abassia, Cairo, Egypt.

Isolation of Corynebacterium pseudotuberculosis

Swabs from abscesses taken and transmitted with minimum of delay to laboratory for bacteriological investigation. Swabs streaked directly onto 5% sheep blood agar and brain heart infusion agar plates were incubated for 24 – 48 hrs at 37ºC. Isolation were identified to C.P. Corynebacterium pseudotuberculosis based on colonial morphology gram stain and biochemical

identification, according to Carter and John (1990).

Measurement of humeral immune response done by Elisa

Detection of specific antibodies for Corynebacterium pseudotuberculosis in serum samples from immunized sheep and goats measured by Elisa (Maki et al., 1985)

Antigen preparation:

A culture grown in brain heart infusion broth to which 0.1% Tween 80 was added, after 72 hrs incubation on a mechanical shaker. The culture refrigerated at 4 ºC over night. The super nation broth centrifuged and subsequently filtered through a membrane filter to remove all cells. This constituted the source of toxin, which preserved with 1:10000 methiorate and kept at 4 ºC for 96 wells. Elisa microtitre plates were coated with the prepared antigen (20 µg/well) dissolved in carbonate bicarbonate buffer pH 9.6. The plates were then blocked with 5% skimmed milk; these plates were used for titration of the collected serum samples for Corynebacterium pseudotuberculosis specific antibodies.

Two fold dilution from 1:2 to 1:256 of lamb sera were made and dispensed into the microtiter plates (50 µl/well) and the plates were incubated at 37 °C for 30 min., The plates washed 3 times using PBS containing 0.05% tween 20 (PBST) horseradish peroxidase donkey anti sheep IgG (Bethyl laboratories Inc.), diluted 1/1000 dispended in the wells (50 µl/well), the plates were incubated at 37 ºC for 30 min, then washed 3 times using PBST. ABTS substrate (KPH, Gaithers). Burg MD 20879. USA) was added (5 µl/ wells) and incubated at 37ºC for 15 min. Then the reaction stopped by addition of 25 µl/well 1 % sodium dodocyl sulphate (SDS). Plate were red using Elisa reader at 405mn. (Rose et al. , 2002)

Feeding system:

Ewes and Does fed to cover their requirements according to NRC (1985). A basal ration consisting of 50% concentrate feed mixture (CFM) and 50% fresh berseem (FB, Trifolium Alexandrinum) during winter-feeding (during experimental). The CFM was consisted of 40% wheat bran, 30% ground yellow corn, 24% undecorticated cottonseed meal, 3% cane molasses, 2% limestone and 1% common salt. feed offered to does and ewes adjusted based on body weight changes and physiological status of animals .Daily feed amounts of 1.250 and 1.00 kg CFM offered to ewes and does , respectively at 8 am plus 4 kg FB. Composite feedstuffs samples taken and stored for laboratory proximate analysis purpose. Samples analyzed according to the methods of the A.O.A.C (1995). Chemical composition of ingredients and experimental diets presented in Table (1).

Suckling period:

After parturition, lambs and kids allowed to suckle dams up to 3 months old where they weaned. Offspring kept on the same feeding system according to NRC (1985) using CFM and fresh berseem (FB).

Milking and Measurements

Milk yield recorded bi-weekly, during the suckling period, all animals were hand milked every two weeks. Hand milking was carried out twice daily using oxytocin technique (Doney et al., 1979) at 6 am and 5 pm. Also, milk samples taken monthly for chemical analysis to determine fat, protein, lactose, solids not fat and total solids by Milko-Scann apparatus (133BN.FOSS Electric, Denmark).

Body weight of kids and lambs

Birth weight (BW), monthly weight and weaning weight during suckling period were recorded.

Statistical analysis

Data subjected to statistical analysis using one-way-analysis of variance according to Snedecor and Cochran (1980). The significant differences between means was statistically measured for significance at ($P<0.05$) according to Duncan's test (1955). The general linear model of SAS (2009) program used in processing measured parameters according to the following mathematical model:

$Yij = \mu + Ti + eij$

Table (1): Chemical composition of ingredients and experimental diets (%, on DM basis).

Item	FB	CFM	Winter diet
DM	17.06	89.95	53.51
OM	88.59	87.76	88.18
CP	16.65	14.40	15.53
CF	20.98	15.08	18.03
EE	2.35	2.40	2.38
NFE	48.61	55.88	52.24
Ash	11.41	12.24	11.82

FB: Fresh berseem. CFM: Concentrate feed mixture.

Where: Yij is the parameter under analysis, μ is the overall mean, Ti is the effect due to treatment and eij is the experimental error.

RESULTS AND DISCUSSION

Sheep and goats constitute one of the major sectors of animal wealth in Egypt and contribute significantly to the domestic meat demand. Most sheep and goats face the risk of bacterial diseases caused by various byogenic organisms especially C.

Pseuotuberculosis often cause abscesses formation in various body sites. Appearance of abscesses in sheep and goats creates a marketing problem due to decline of meat quality and quantity and condemnation of the affected portions and internal organs. Animals with abscesses may become anemic and emaciated, which leads to significant economic losses due to loss of body weight, drop in birth rates and reduction in milk production (Hatem et al., 2013). The ability of Corynebacterium pseudotuberculosis to infect both animals and humans makes importance for studies on prevention and diagnosis of this pathogen (Bastos et al., 2012).

Bacteriological examination of the bus swabs collected from external abscesses revealed the recovery of Corynebacterium pseudotuberculosis with prevalence rate of 3% and 4% in sheep and goats (Table 2), respectively, which is similar result for those reported by Musa (1998)(6.35%), Ben Said et al., 2002 (5.1%), Ziad and Taher, 2012 (4.87%), Kumar et al., 2013 (2.31%) and Oreiby et al., 2014 (6.7%), while others gave higher rates; Osman et al., 2008 (19.3%), Baird et al., 2004 (9.93% in sheep) and some gave lower rates; Kuria and Nagattia (1990) (1.6% - 13.36%) and Mubarak et al., 1999 (0.2%). Prevalence of Corynebacterium pseudotuberculosis was significantly higher in goats than sheep. The results agree with Kuria and Nagattia (1990) and Ashfaq and Campbell, (1999).

The variation in the disease prevalence between different studies may attributed to management system, climate, contaminated environment, endemic nature of disease. Serological detection of Corynebacterium pseudotuberculosis enables the detection of clinical/subclinical cases, Elisa is the most common serological test used to detect immune responses against Corynebacterium pseudotuberculosis (Chirino – Zárrga et al., 2009)

Table 2: Isolation of Corynebacterium pseudotuberculosis from local abscesses from sheep and goats.

	Sheep	Goats
Number of animals	400	400
Number of local abscesses	20	32
Number of isolation	12	16
% of Isolation	3	4

Antibody titre in the sera of pregnant sheep and goats vaccinated by B.C.G. at first month of pregnancy as first dose, and at 3 month later as second dose monitored by employing Elisa. The results as shown in table (3) revealed that the mean O.D value of vaccinated pregnant sheep increased from 0.297± 0.2 at birth until reach to

0.781±0.05 at 3rd month whereas the control titre reveled 071±0.05, the overall titre of vaccinated pregnant sheep was 0.483±0.02 compare to 0.83±0.02 in control. The mean O.D. value of vaccinated pregnant goats increased from 0.421±0.05 at birth to 0.798±0.08 at 3rd month while control titre revealed 0.076±0.08. The overall titre of vaccinated pregnant goats was 0.561±0.06. Results indicate a significant increase in the titre of humeral immunity in vaccinated pregnant sheep and goats than non-vaccinated with detectable elevation in the titre in goats than sheep (Table 3).

The mean O.D value for offspring of sheep and goats (vaccinated and non-vaccinated) (table 4) revealed significant increase in humeral immune response in vaccinated lambs and kids than non-vaccinated. The study agree with, Menzies et al., 1991 and Johnson et al., 1993, who recorded that sheep and goats differ in their response to vaccination against Corynebacterium pseudotuberculosis.

Table (3): Means of O.D. reading for pregnant sheep and goats affected by treatment (vaccinated with BCG and non-vaccinated one).

Item	Sheep		±SE	Goats		±SE
	Control	Vaccinated		Control	Vaccinated	
At birth (parturition)	0.052^{b}	0.297^{a}	0.02	0.065^{b}	0.421^{a}	0.05
At 1st month	0.067^{b}	0.307^{a}	0.02	0.062^{b}	0.435^{a}	0.05
At 2nd month	0.062^{b}	0.548^{a}	0.06	0.071^{b}	0.587^{a}	0.08
At 3rd month	0.071^{b}	0.781^{a}	0.05	0.076^{b}	0.798^{a}	0.08
Overall mean	0.063^{b}	0.483^{a}	0.02	0.068^{b}	0.561^{a}	0.06

a and b: Means within the same row with different superscripts are significantly different (P<0.05).
Control group: non-vaccinated animals Vaccinated group: vaccinated animals

Table (4): Means of O.D. for offspring of vaccinated and non-vaccinated dams during suckling period.

Item	Sheep		±SE	Goats		±SE
	Control	Vaccinated		Control	Vaccinated	
At 1st month	0.035^{b}	0.381^{a}	0.04	0.062^{b}	0.415^{a}	0.04
At 2nd month	0.057^{b}	0.531^{a}	0.07	0.071^{b}	0.593^{a}	0.04
At 3rd month	0.052^{b}	0.756^{a}	0.07	0.042^{b}	0.792^{a}	0.06
Overall mean	0.048^{b}	0.556^{a}	0.03	0.058^{b}	0.601^{a}	0.03

a and b: Means within the same row with different superscripts are significantly different (P<0.05).
Control group: non-vaccinated animals
Vaccinated group : vaccinated animals

The present study agree with Barakat et al., (1974) who reported that BCG stimulated immunity against Corynebacterium pseudotuberculosis in guinea pigs, Selim et al., (2010) proved that combined BCG and mutant recumbiant phospholipase D (mrPLD) without adjuvant gave the least extent of protection against caseous lymphadenitis (66%), Ebeid et al., (2011) detected that BCG could be helpful when used before vaccination of sheep with 50 mg PLD toxoid and 20 mg formalized bacterium adjuvented Montanide oil to improve the level of immune response of sheep against Corynebacterium pseudotuberculosis.

Regarding use of BCG as non-specific cellular immunostimulant heterogeneous vaccine, Cameron and Fatthjm (1984) reported that immunization with BCG alone had no protective

effect against caseous lymphadenitis. In contrast, Barakat et al. (1979) concluded that BCG can used alone for vaccination against caseous lymphadenitis where it induced protection of 90% of lambs under natural infection condition.

Production performance

Milk yield and composition

Data of milk yield and composition for sheep and lactating goats vaccinated by BCG presented in Table (5). There was a significant increase in milk yield for sheep and goats vaccinated compared to control (Table 5).

The yield of milk during 1st and 2nd months were higher (P<0.05) than during 3rd month for sheep and goats, which agree with the general knowledge that milk yield arrives maximum at1st -2nd months after parturition then declines (INRA, 1988 and Adewumi et al., 2011). These results reflect the mobilization of immune body reserves to improve metabolism of milk synthesis in ewes and does, as indicated by the positive effect of vaccination by BCG on the amounts of milk yield (relative improve %) compared with control either for sheep or goats. This role may because the improvement of biological function of all organs in the body. These results are similar with those obtained by Singh et al., (2011) who found that milk yield after vaccination showed significant increase than pre vaccination by 22.3%. The reduction in milk yield may be a result of the negative effect of early infection of microbe to each of lymph nodes and internal organs, resulting in total loss of milk production (Yeruham et al., 2003).

To the best of our knowledge, comparable information with respect to increase in milk yield after vaccination of goat herd is not available in the literature so far.

Milk composition including percentages of fat, protein, lactose, total solids, solids not fat at 1st, 2nd and 3rd months and also overall mean during suckling period are shown in Table (5). Vaccinated ewes significantly (P<0.05) had the lowest milk composition at most months of suckling and also overall means. On, the other hand, milk composition increased gradually until the end of suckling period. The trend of milk composition (%) was in negative relationship with milk yield during suckling intervals and overall. These results are similar with those obtained by Hayder (2004) and Adewumi et al. (2011).

Vaccinated does significantly (P<0.05) had lower milk composition at most suckling months and overall mean. While, milk composition (%) was decreased at the 2nd month then increased at the 3rd month. These results are in agreement with those obtained by INRA, (1988). These results reflected on the milk energy and protein suckled by offspring until weaning (Table 5). In general, lambs body weight gain until weaning reflect milk production ability of their dams (Snowder and Glimp, 1991). It reported that immunity transported to the offspring (lambs) along two pathways: via the placenta during the fetal stage, and with the colostrum at the neonatal phase. The reason of higher body weight at weaning due to increasing average daily gain for vaccinated group which will discuss in next section.

Birth and weaning weight and daily gain of offspring:

Data concerning birth weight, weight gain and daily gain of offspring, from birth up to weaning, for both sheep and goats vaccinated by BCG are shown in Table (6). Slight increase was observed due to treatment on birth weight of both offspring of sheep and goats, while the differences were significant (P<0.05) at 1st, 2nd and 3rd months weights, during suckling. Results of milk production were in harmony with weights of offspring (Tables 5 & 6).

Table (5): Milk yield and composition for sheep and goats affected by treatment with BCG during suckling period (3 months).

Item	Sheep			Goats		
	Control	Vaccinated	±SE	Control	Vaccinated	±SE
Average milk yield (kg/h/d):						
At 1st month	0.425[b]	0.446[a]	0.18	1.252[b]	1.416[a]	0.22
At 2nd month	0.317[b]	0.346[a]	0.27	1.295[b]	1.481[a]	0.13
At 3rd month	0.207[b]	0.238[a]	0.54	0.966[b]	1.135[a]	0.41
Overall means	0.316[b]	0.343[a]	0.21	1.171	1.344[a]	0.23
Relative improve (%)	100.00[b]	108.54[a]	0.04	100.00[b]	114.77[a]	0.09
Milk composition (%):						
At 1st month:						
Fat (%)	3.58[a]	3.33[b]	0.07	3.22	3.2	0.13
Protein (%)	3.69[a]	3.43[b]	0.03	3.11[a]	3.03[b]	0.26
Lactose (%)	4.55[a]	4.25[b]	0.21	4.27[a]	4.09[b]	0.41
Total solids (%)	12.58	11.71	0.57	11.21	11.11	0.21
Solids not fat (%)	9.00[a]	8.37[b]	0.38	7.99	7.91	0.37
At 2nd month:						
Fat (%)	5.08[a]	4.98[b]	0.21	3.15[a]	3.06[b]	0.17
Protein (%)	4.14[a]	4.08[b]	0.09	3.01	2.88	0.39
Lactose (%)	5.02	4.99	0.18	4.11[a]	3.75[b]	0.23
Total solids (%)	14.97	14.76	0.31	10.93[a]	10.38[b]	0.06
Solids not fat (%)	9.89[a]	9.78[b]	0.07	7.78[a]	7.32[b]	0.02
At 3rd month:						
Fat (%)	6.07[a]	5.88[b]	0.34	3.96[a]	3.66[b]	0.28
Protein (%)	4.65	4.53	0.17	3.25	3.21	0.53
Lactose (%)	5.33[a]	5.21[b]	0.12	4.48[a]	4.31[b]	0.44
Total solids (%)	16.68[a]	16.42[b]	0.08	12.38[a]	11.89[b]	0.06
Solids not fat (%)	10.61[a]	10.54[b]	0.02	8.42[a]	8.13[b]	0.13
Overall mean milk composition (%) during suckling period						
Fat (%)	4.91[a]	4.73[b]	0.19	3.44[a]	3.31[b]	0.22
Protein (%)	4.16[a]	4.01[b]	0.11	3.12[a]	3.04[b]	0.41
Lactose (%)	4.96	4.81	0.14	4.28[a]	4.05[b]	0.33
Total solids (%)	14.74[a]	14.29[b]	0.24	11.52[a]	11.09[b]	0.09
Solids not fat (%)	9.83	9.56	0.61	8.08[a]	7.78[b]	0.07
*** Milk yield from:**						
Fat (g/h/d)	15.51[b]	16.22[a]	0.02	40.28[b]	44.48[a]	0.03
Protein (g/h/d)	13.14[b]	13.75[a]	0.07	36.53[b]	40.85[a]	0.05

a and b: Means within the same row with different superscripts are significantly different (P<0.05).
Control group: non-vaccinated animals Vaccinated group : vaccinated animals
* = milk yield * fat or protein (%)

Table (6): Birth and weaning weight and daily gain of offspring of sheep and goats affected by treatment with BCG during suckling.

Item	Sheep			Goats		
	Control	Vaccinated	±SE	Control	Vaccinated	±SE
Offspring weight (kg):						
At birth	3.67	3.78	0.13	3.23	3.42	0.11
At 1st month	6.73[b]	7.87[a]	0.19	6.34[b]	7.53[a]	0.23
At 2nd month	11.26[b]	12.35[a]	0.35	9.12[b]	10.58[a]	0.72
At 3rd month (weaning)	14.06[b]	15.74[a]	0.67	12.23[b]	13.86[a]	0.85
Offspring weight gain (kg):						
From birth - 1st month	3.06	4.09	0.03	3.11	4.11	0.08
From 1st– 2nd month	4.53	4.48	0.12	2.18	3.05	0.14
From 2nd – 3rd month	2.80[b]	3.39[a]	0.13	3.11[b]	3.28[a]	0.06
Total gain (kg)	10.39[b]	11.96[a]	0.31	9.00[b]	10.44[a]	0.37
Offspring weight daily gain (g):						
From birth - 1st month	102	136.33	0.66	103.66	137	0.79
From 1st– 2nd month	151	149.33	0.28	92.66	101.16	0.63
From 2nd – 3rd month	93.33[b]	113.00[a]	0.11	103.66[b]	109.33[a]	0.27
Average daily gain (g)	115.44[b]	132.88[a]	0.05	100.00[b]	116.0[a]	0.08
Relative improve (%)		115.1	0.14		116	0.02

a and b: Means within the same row with different superscripts are significantly different (P<0.05).
Control group: non-vaccinated animals. Vaccinated group: vaccinated animals .

On the same trend, weight gain and daily gain were higher in both offspring of vaccinated sheep and goats than control with slight differences at birth and until 1st month then significant (P < 0.05) during 2nd – 3rd months and total weight gain during suckling period (3 months).Relative improvement (%) measured by 115 and 116% in weight gain of offspring of sheep and goats , respectively.

These results is in consistent with those reported by Reddacilff et al., (2006), Hines et al., (2007) and Paton et al., (1988).

The study conclude that vaccination with BCG in farms infected with corynebacterium pseudotuberculosis increase the immunity level against the disease and optimize the production performance of sheep and goats. Further study has to done to produce a specific vaccine for control of corynebacterium pseudotuberculosis infection besides applying good practices of animal management.

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REFERERNCES

Adewumi, O. O. ; Chineke, C. A. ; Alokan, J. A. ; James, I. J. and Akinola, O. A. (2011). The effect of genotype and week of lactation on milk yield, udder dimensions and linear body measurements of non-dairy ews. Nigerian J. Anim. Prod., 38: 9-17.

AOAC (1995). Association of Official Analytical Chemists. Official Methods of Analysis, 15th Ed., Washington, DC.

Ashfaq, S,G. and Cambell, S.G. (1979): A Survey of caseaus lymphadenitis and its etiology in goats in United States.

Vet. Med. Small Amin. Clin. 74: 1161-1185

Baird, G.J. and Fontaine, M.C. (2007): Corynebacterium pseudotuberculosis and its role in .j, ovine Caseous lymphadenitis. J. COMP. PATOL.137,179-210.

Baird, G.; Synge, B. and Dercksen, D. (2004): Survey of caseaus lymphadenitis seroprevalence in British terminal sire sheep breeds. Vet. Rec., 154:505 – 506

Barakat, A.A., Saber, M.S. and Awad, H.H. 1979. Immunization studies on C. ovis infection in Guinea pigs by the use of BCG and heat killed Corynebacterium ovis vaccine. J. Egypt. Vet. Med. Ass. 34: 37-46.

Barakat, A.A., Selim, S.A., Atef, A., Saber, M.S., Nafie, E.K. and El-Edeeby, A.A. , (1984). Two serotypes of Corynebacterium pseudotuberculosis isolated from different animal species. Revue Scientifique et Technique Office International des Epizooties 1984; 3:151-168

Bastos, B.L., R. W. Dias Portela, F. A. Dorella, D. Ribeiro, N. Seyffert, T. L. de Paula Castro, A. Miyoshi, S. C. Oliveira, R. Meyer, and V. Azevedo. 2012. Corynebacterium pseudotuberculosis: Immunological responses in animal models and zoonotic potential. J. Clin. Cell Immunol. S4:005. doi:10.4172/ 2155-9899. S4-005

Batey, R.A. (1986) Pathogenesis of caseous lymphadenitis in sheep and goats. Aust. Vet. J. 63 : 269-272

Ben Said, M.S., Ben Maitigue, H., Benzarti, M., Messadi, L., Rejeb, A. and Amara, A. (2002). Epidemiological and clinical studies of ovine caseous lymphodentistis. Arch. Inst. Posteur Tunis, 79 (1-4):51-57.

Brogden, K.A., Cutlip, R.C., Lehmkuhl, H.D., (1984): Comparison of protection induced in lambs by Corynebacterium pseudotuberculosis whole cell and cell wall vaccine. Am.J. Vet. Res., 45:2393-2395.

Broghen, K.A., Glenn, J.S., East, N., and Audibert, F. (1996) : A Corynebacterium pseudotuberculosis bacterium with muramyl dipeptide induce antibody titres, increases the time of onset, and decreases naturally occurring external abscesses in sheep and goats. Small. Rumin. Res. 19:161-168.

Brown, C.C., Olander, H.J., Biberstein, E.L., and Morse, S.M. (1986) : Use of toxoid vaccine to protect goats against intradermal challenge exposure to Corynebacterium pseudotuberculosis. Am. J. Vet. Res. , 47: 1116-1119.

Brumbaugh, G.W. and T.L. Ekman, (1981). Corynebacterium pseudotuberculosis bacteremia in two horses J. Am. Vet. Med. Ass., 178:300-301

Bull. Amin. Health prod. Afr., 38:15-18

Cameron, C.M. and Fatthj Bester 1984. Studies on the enhancement of immunity to Corynebacterium pseudotuberculosis.

Cameron, C.M., Minnar, J.L., Engel brecht, M.M. and Purdom, M.R. (1972) : Immune response of merino sheep to inactivated Corynebacterium pseudotuberculosis Vaccine. Onderstepoort. J. Vet. Res., 1: 11:24

Can. J. Vet. Res., 55(4) : 362-366.

Carter, G.R. and John, R.C. (1990): Diagnostic procedures in veterinary Bacteriology and Mycology. 5th Ed., P.P. 263-270

Chirino-Zárraga, C., Rey-Valeirón, C., Scaramelli, A., Carrero, L., 2009. Diagnosis of caseous lymphadenitis by ELISA in naturally infected goats from Venezuela. Small Rumin. Res. 87, 92–95.

Doney, J.M., Peart J.N., Smith W.F. Louda M. 1979. A consideration of the 298 techniques for estimation of milk yield by suckled sheep and comparison of estimates obtained by two methods in relation to the effect of breed, level of production and stage of lactation. J. Agric. Sci. (Camb), 92:123-132.

Duncan, D.B. (1955). Multiple Range and Multiple F-test. Biometrics, II: 1- 42.

Ebeid, M. H.; Moustafa, A. M.; Hamoda, F.K., Abd el-Azeem, K.A. Khodeir, M.H, Bakr, A.A., Nabila A. M. Ghazyb (2011): Trials of preparation and evaluation of coryobacterium Pseudotuberculosis vaccines in sheep. Benha Vetrinary Med. J., Vol 22 (2):104-117

Eggleton, D.G., Middleton, H.D., Doidge, D.G., and Minty, D.W. (1991): Immunization against caseous lymphadenitis : Comparison with of Corynebacterium pseudotuberculosis vaccines with and without bacterial cells. Aust. Vet J. 68:317-319

Ellis, T.M., Sutherland, S.S., Wilikinson, F.C., Mercy, A.R. and Paton, M.W., (1978): the role of Corynebacterium pseudotuberculosis lung lesions in the transmission of this bacterium to other sheep. Aust. Vet. J., 64: 261-263

Global Veterinaria, 10 (4) : 372-381

Hatem, M.E. R. H. Arab Atas, Sherein I. Abdel-Moez, Eman A.K. and E.A. Fouad (2013): Bacterial Abscessation in sheep and Goat in Giza Governorate with full Antibiogram screening.

Global Veterinaria, 10 (4) : 372-381

Hayder, M. (2004). Performance of ewes fed sugar cane bagasse silage treated with different levels of urea. Ph. D. Thesis, Fac. Of Agric., Assuit Univ., Egypt.

Hines, M. E. ; Stiver, S. ; Giri, D. ; Whittington, L. ; Watson, C. ; Johnson, J. ; Musgrove, J. ; Pence, M. ; Hurley, D. ; Baldwin, D. ; Gardner, I. A. ; Aly, S. (2007). Efficacy of pheroplastic and cell-wall competent vaccines for mycobacterium avium sub sp. Paratuberculosis in experimentally – challenged baby goats. Vet. Microbiol. 120: 261-283.

INRA, Institute National de La Recherche Agronomique (1988). Alimentation des Bovines, Ovins, et Caprins, INRA, Paris.

International Journal of Microbiological Research 1 (3): 129-136.

Johnson, E.H., J. Santa Rosa and P.H. Kass (1993**)**: Immunisation effect of Coryne-bacterium pseudotuberculosis in goats., Small Ruminant Res., 12(3) 349-356

Kumar, J., B.N. Tripathi, R. Kumar, G.G. Sonawance and S.K. Dixit (2013) : Rabia detection of Corynebacterium pseudotuber-culosis in clinical samples from sheep Tropical Animal Health production, 45(6): 1429-1485

Kuria, J.N., Nagattia, T.A., (1990) Caseaus lymphadenitis of sheep and goats in Kenya. Bull. Anim. Health. Prod, Afr.,38 :15-18.

Maki, L.R., Shen, S.H., Bergstom, R.C. and Stetzenbach, L.D. (1985): Diagnostic of Corynebacterium pseudotuberculosis infection in sheep using an enzyme immunosorbent assay. Am. J. Vet. Res., 1: 212-214.

Menzies, P.I., C.A., Muckle, K.A., Brogden and L. Robison, (1991): A field trial to evaluate a whole cell vaccine for prevention of caseaus lymphadenitis in sheep and goats flocks. Can. J. Vet., Res .,55(4)362-366.

Mubarak, M., Bastawrows, A.F., Abdel-Hafeez; M.M. and Ali, M.M. (1990): caseaus lymphadenitis of sheep and goats is Assiout farm and battoirs Assiut vet. J., 42: 89-112.

Musa, M.T. (1998): lymphadenitis in sheep and goats in sudan.

Revue d'elevage et de Medicine Veterinaire des pays Tropicaux, 51: 109-111

Nairn, M.E. and Robertson, J.P. (1974): Corynebacterium pseudotuberculosis infection

of sheep: role of skin and dipping fluids. Aust. Vet J. 50:537-542

NRC (1985). Nutrient Requirement of small ruminant. 6th revised edition. The National Research Council, Washington D.C. National Academy of Scienc.

Onderstepoort J. Vet. Res. 40: 105-114.

Oreiby A.F. Hegazy, Y.M., Osman, S.A., Ghanem, Y.M. and Al-Gaabary, M.H. (2014):

caseaus lymphadenitis in small ruminants in Egypt, Clinical, epidemiological and prophylactic aspects.

Tierazlt pray Ansg G Grosstieve Nutztianre 42(5): 271-277

Osman, A.O., Amany, I. El-Bialy and Ebtehal, Abd El-Aty (2008): Comparison of protection induced by Corynebacterium pseudotuber-culosis toxoid and BCG vaccines in lambs. Vet. Med. J. Giza., 56(3) : 239-253.

Paton, M. (1993): Control of cheesy gland in sheep. West. Aust. J. Agric. 34: 31-37

Paton, M.W., A.R., Mercy, F.C. Wikinson, J.J. Gardner, S.S. Sutherland, and T.M. Ellis. (1988) the effect of caseous lymphadenitis on wool production and body weight in young sheep. Aust. Vet J. 65:117-119

Paton, M.W., Walker, S.B., Walker, L.R. Rose and Watt, G.F. (2003). Prevalence of caseous lymphadenitis and usage of caseous lymphadenitis vaccines in sheep flocks. Aust. Vet J. 2003; 81:91-95.

Piontkowski, M.D. and Shivvers, D.W. (1998): Evalution of a commercial available vaccine against Corynebacterium pseudotuberculosis for use in sheep. J.Am. vet. Med. Assoc., 212: 1765: 1768

Reddaliff, L. Eppleston, J.; Windsor, P.; Whittington, R.; Jones, S. (2006). Efficacy of killed vaccine for the control of paratuber culosis in Australian sheep flocks. Vet. Microbiol., 155:77-90. Revue d'elevage et de Medicine veterinaire des pays Tropicaux, 51: 109-111

Rose, R.; Tannent, J.; Mc Water, P.; Chaplin P.J.; Wood, P.R.; Kimpton, W.; Cahill, R.; Pierre, J. and Scheerlink,Y.(2002): Efficiency of DNA vaccination by different routes od immunization in sheep. Vet. Immunal, Immunopath., 90:55-63.

SAS (2009). Statistical Analysis System. SAS Institute, version 9.2. Cary, NC, USA.

Selim, S.A.G. and Mohamed, Kh, F.C. (2010): Vaccinal Efficacy of Genetically Inactivated phospholipase D against coseous Lymphdenitis in small Ruminants

International Journal of Microbiological Research 1 (3): 129-136.

Singh, S. V. ; Singh, P. K. ; Singh, M. K. ; Singh, A. V. and Sohal, J. S. (2011). Therapeutic potential of johne's disease vaccine: A follow up post vaccination study in a goatherd of endangered Jamunapari breed, naturally infected with Mycobacterium avium subspecies paratuberculosis. International Journal of Livestock Production. Vol. 2(13): 192-204.

Snedecor, G. W. and W. G. Cochran (1980). Statistical methods, 7th Ed., Allied pacific, Bombay, India.

Snowder, G.D. and H.A. Glimp (1991). Influence of breed, number of suckling lambs, and stage of lactation on ewe milk production and lamb growth under range condition. J. Anim. Sci., 69: 923-930.

Yeruham, D.; Elad, S. and Friedman, S.P. (2003). Corynebacterium pseudotuberculosis infection in Israeli dairy cattle. Epidemiol Infect 131: 947–955.

Yeruham, I.; Braverman, Y. and Shpigel, N.Y. (1996). Mastitis in dairy cattle caused by Corynebacterium pseudotuberculosis and the feasibility of transmission by houseflies. Vet Q 18: 87–89.

Ziad A.A. and Taher, A (2011) : The surgical treatment of caseaus lymphadenitis in Awassy sheep. Assiut Vet. J., 85(132):1-21.

Egyptian Journal of Sheep & Goat Sciences, Vol. 11, No. 3, December 2016 &Proceedings Book of the 6th International Scientific Conference on Small Ruminant Production, 6- 10 Nov., 2016, Sharm El Sheikh, Egypt, P: 76-87

الملخص العربى

دراسه العلاقه بين الاداء الانتاجى للأغنام والماعز والاصابه بمرض السل الكاذب

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تم فحص 400 راس من الاغنام و400 راس من الماعز فى عمر 3 الى 4 سنوات لتحديد مدى الاصابه بمرض السل الكاذب فى محطات معهد بحوث الإنتاج الحيوانى . تم الدراسة على عينة من مجموعتين، الاولى شملت 8 حيونات عشار من كل من الاغنام و الماعز حيث تم التحصين بلقاح BCG عند عمر شهر من الحمل كجرعه اولى واعقبها جرعة ثانية عند عمر 4 شهور من الحمل ومجموعه الكنترول بدون تحصين وشملت 4 حيونات من كل نوع . تم قياس الأجسام المناعية فى الأمهات والنتاج بأستخدام اختبار الاليزا عند عمر الولادة ولمدة ثلاث اشهر متتابعة، وتم قياس كمية اللبن والتركيب الكيماوى له فى الامهات المحصنة والكنترول وسجلت الاوزان للمواليد عند عمر الميلاد ولمدة ثلاث اشهر متتالية بعد الولادة. تم عزل ميكروب السل الكاذب بنسبه 3 و 4 % فى الاغنام والماعز على الترتيب . واظهرت النتائج زيادة فى الأجسام المناعية بعد التحصين بلقاح BCG فى الاغنام والماعز المحصنة عن الكونترول مع زيادة طفيفه فى الاستجابه المناعيه فى الماعز عن الاغنام وزيادة فى الأجسام المناعية فى الحملان والجديان المولودة من أمهات محصنة عن الكونترول وكذلك زيادة فى كميه اللبن المنتج فى الامهات المحصنة عن مجموعه الكنترول مع انخفاض طفيف فى تركيب اللبن وخصوصا فى الاشهر الاولى من موسم الحلابه . سجلت النتائج زيادة ملحوظه فى اوزان المواليد فى الامهات المحصنه عن مجموعه الكنترول. ومن خلال هذه الدراسه نوصى بتحصين الاغنام والماعز بلقاح BCG لرفع المناعه ضد مرض السل الكاذب وزيادة الأداء الإنتاجي للحيوانات .