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SEROLOGICAL SURVEY OF ANTIBODIES TO SALMONELLA GROUPS A, B, C AND D IN DROMEDARY CAMELS OF IRAN

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ABSTRACT

Salmonellosis is considered as one of the most widespread food borne zoonoses. The non-symptomatic infected animals are the common sources of food borne salmonellosis. This study carried out to determine distribution of *Salmonella* serotypes infections in apparently healthy slaughter camels in central Iran. Three hundred and eighty four camel serum samples were tested for presence of anti-*Salmonella* antibodies by rapid and tube agglutination tests. Anti-*Salmonella* antibodies were positive in 8 (2.08%), 8 (2.08%), 7 (1.82%) and 5 (1.30%) samples against A, B, C and D somatic antigens, respectively. All of anti-*Salmonella* antibody titres were less than 80 in tube agglutination test. There was no significant correlation between sex and seropositivity. The results showed that apparently healthy camels may be infected by different *Salmonella* serotypes and could be a source of carcass and organ contamination with *Salmonella* at abattoirs. In camels, *Salmonella* can cause enteritis, septicemia and abortion especially in young animals. The low titres may be due to age of animals because all samples were collected from 2 or more years old apparently healthy camels.

Key words: Antibodies, camel, dromedary, Iran, *Salmonella*, serology

Salmonellosis is considered as one of the most widespread food borne zoonoses in industrialised as well as developing countries even though the incidence seems to vary among them. It is usually difficult to evaluate the situation of salmonellosis in developing countries because of the very limited scope of studies and lack of coordinated epidemiological surveillance systems (Molla *et al*, 2003). The incidence of non- typhoid salmonellosis in humans has increased in recent years and animals have been incriminated as the principal reservoirs. *Salmonella* infections occur wordwide in all animals (Wernery and Kaaden, 2002). Food animals harbour a wide range of *Salmonella* serotypes and so act as source of contamination which is of paramount epidemiological importance in non-typhoid human salmonellosis. The non-symptomatic infected animals are the common sources of food borne salmonellosis. Infections occur due to ingestion of feed or water contaminated with *Salmonella* as well as by direct contact with contaminated excreta of carriers. Numerous authors have reported salmonellosis and *Salmonella* infections in camels in different parts of the world. In camels, *Salmonella* can cause enteritis, septicemia and abortion. Chronic salmonellosis is characterised by diarrhoea, weight loss and death within a few weeks (Fazil and Hofmann, 1981). A periodic surveillance of *Salmonella* contamination in the different food animals, food products and environment is necessary to control the spread of the pathogen and infection of man (Molla *et al*, 2003). The purpose of this study was to determine distribution of *Salmonella* serotypes infection in apparently healthy camels slaughtered in central Iran. About 10,000 camels (*Camelus dromedarius)* are reared in Iran and their meat is an important source of protein. Furthermore, many camels are imported from neighbouring countries, i.e. Afghanistan and Pakistan every year.

Materials and Methods

Blood samples were collected from apparently healthy camels that came from various provinces including Sistan va Balouchestan, Yazd, Kerman, Khorasan, Esfahan and some other countries (Afghanistan and Pakistan) as well. They were slaughtered in Najafabad abattoir in Esfahan province (central Iran) in summer of 2003. Three hundred and

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eighty four samples of camel serum were screened for presence of anti-*Salmonella* antibodies by rapid slide agglutination test. They included those of 219 males and 165 females of different ages. Four killed coloured somatic (O) antigens were prepared from *S.paratyphi* A, *S.typhimurium, S.paratyphi C* and *S.entritidis* as serogroups of A, B, C and D, respectively. To determine titres of these antibodies, the positive sera were tested by conventional tube agglutination test. Briefly, serial 2-fold dilutions of sample of serum were mixed with standard bacterial suspensions. The highest dilution of serum capable of agglutinating the bacteria was the titre of the antibody (Levinson and Jawetz, 1998). Anti- O antibodies were determined in positive samples of rapid slide agglutination test.

Results

Anti-*Salmonella* antibodies were positive in 8 (2.08%), 8 (2.08%), 7 (1.82%) and 5 (1.30%) samples against A, B, C and D antigens, respectively (Table 1). There was no significant correlation between sex and seropositivity ($p > 0.05$). There were no significant differences among frequency of infection in different age groups (Table 2). All of anti-*Salmonella* antibody titres were less than 80 in tube agglutination test.

Discussion

Salmonella has become an important zoonosis in the last few years. Contaminated animal products are main source for non- typhoidal salmonellosis, therefore the preventive measures must also be taken them into account. It is especially true in several African countries such as Egypt, Sudan, Somalia and middle east like Iran where meat from dromedaries is consumed. Food poisoning due to dromedary meat has been reported by Sandiford (1944), Ramadan and Sadek (1971) and El-Nawawi *et al* (1982). In the UAE, Wernery and Makarem (1996) identified a large number of identical *Salmonella* serotypes in the stool of people affected with salmonellosis and the faecal samples of dromedaries. In Egypt, Kamel and Lotfi (1963) reported that 3.1% of camels were positive for *Salmonella* by bacterial culturing of intestinal lymph nodes and faecal samples received from slaughter house. The authors believe that the dromedaries are an important reservoir for *Salmonella* and could therefore represent a health hazard for men (Wernery and Kaaden, 2002). *Salmonella* spp. were also isolated in Sudan (Curasson, 1918), Palestine (Olitzki and Ellenbogen, 1943), French North Africa (Donatien and Boue, 1944), USA (Bruner and Moran, 1949), and more recently from Morocco, Niger, Somalia, Ethiopia, Egypt, and the UAE (Wernery and Kaaden, 2002). Reports of *Salmonella* infections have appeared in south of Iran (Tadjebakhsh *et al,* 1992). They isolated 14 *Salmonella* spp. from 13 mesentric lymph nodes and faecal samples. *Salmonella* reading was the dominant species among them. Bazargani *et al* (2001) found that 0.59% of samples were positive for anti-group B *Salmonella* antibodies by immunodiffusion test. Antibody titres against O and H antigen were lower than 1.2.

Table 1. Sex-wise prevalence rate of Salmonella antibodies in camel.

Serogroups	Male (219)	Female (165)	Positive sera (%)
A	5	3	8 (2.08)
B	3	5	8 (2.08)
C	4	3	7 (1.82)
D	2	3	5 (1.30)
Total	11 (5.02)	14 (8.48)	28 (7.28)

Table 2. Age-wise prevalence rate of Salmonella antibodies in camel.

Age (Years)	No. of samples	Positive samples(%)
2	58	4 (6.9%)
2-5	68	6 (8.82%)
5-7	69	6 (8.69%)
7-10	62	4 (6.45%)
>10	127	9 (7%)
Total	384	29 (7.96%)

Although many studies were carried out on *Salmonella* detection by culturing methods, only few serological studies have been reported. This study was designed for evaluation of rapid slide agglutination (RSA) test as a proper screening test for anti-*Salmonella* antibodies in dromedary serum. These results were confirmed by tube agglutination test. The results showed that we can screen the sera by RSA in a short time proving it to be a proper test in epidemiological studies. We also suggest that apparently healthy camels in Iran might be infected by different *Salmonella* serotypes in past years and could be a source of carcass and organ contamination with *Salmonella* at abattoirs. The low titres may be due to sampling from apparently healthy camels, chronic infections or cross reactions.

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Expression of the peptidoglycan recognition protein, PGRP, in the lactating mammary gland

The peptidoglycan recognition protein, PGRP, known as an intracellular component of neutrophils, has been isolated from camel (*Camelus dromedarius*) milk by acid precipitation followed by heparin sepharose affinity chromatography of the supernatant. The mean concentration on milk was about 120 mg/L. It decreased during lactation by 19% and increased in the event of severe mastitis by 45%. The protein bound to lactic acid bacteria and other gram positive bacteria with an affinity similar to that reported for the human and murine orthologs, although the isoelectric point of the molecule was distinctly higher at pH 9.02. The N-terminus of mature camel PGRP was determined as NH_2-ArgGluAspProPro-CO_2H. Calculated and measured molecular masses were both 19.1 kDa, excluding the possibilily of posttranslational modification or binding of cation ligands. The peptide probably builds a monotrimer at high concentration. The corresponding mRNA was isolated from lactating mammary gland tissue, and 5.3 kbp of the corresponding gene was sequenced. Similarities were found to the camel lactoferrin gene with regard to sites of expression and to the region 5′ upstream to the gene.

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