Vet. Med. J., Giza, 39, No. 1, 71-79 (19991)

CHARACTERIZATION OF STAPHYLOCOCCUS AUREUS OF CAMEL ORIGIN WITH PARTICULAR REFERENCE TO "PROTEIN A"

BY

N.A. GAD EL-SAID, M. ISMAIL, LAILA ALI, NAGWA ATA AND SOHEIR SHOUKRY

Department of Microbiology, Faculty of Veterinary Medicine, Cairo University and National Research Centre, Dokki, Egypt.

(Received: 22.1.1991)

INTRODUCTION

Bacterial diseases in camels, as in other domestic animals, vary in importance and distribution.

Staphylococcus aureus is responsible for over 80 percent of the suppurative diseases. They cause most pyogenic infections of the skin but may also invade and produce severe infections of the skin and any other parts of the body (Joklik et al., 1980).

Pyogenic wounds and abcesses are perhapes the most important widely spread affection of camels (Shaban, 1979 and Ismail et al., 1985).

In the present work, an investigation was made to determine the occurrence, nature and characteristics of *Staphylococcus aureus* of camels, so that some information could be gained for additional differential characters. In this study particular reference to the occurrence of staphylococcal protein A (SPA) was included to estabilish a possible correlation with other criteria involved.

MATERIALS AND METHODS

Swabs were taken from septic wounds of 85 camels from Cairo abattoir. All swabs were tested for the presence of *Staphylococcus aureus*. Cultures were made of swab samples on the nutrient agar, 5% sheep blood agar, bacto-mannitol salt agar, Baird-parker agar and staphylococcus medium No. 110. After incubation for 24-48 hours at 37°C, they were examined for characteristic colonies and presence of haemolysis. The isoaltes were characterized and identified biochemically according to the proposed Scheme of Sneath et al. (1986) by using the follosing tests:

Haemolytic activity: This was investigated as previously, but using 5% defibrinated sheep blood.

Fermentative acid production of glucose: It was tested for in Hugh and Leifson medium (HLOF) according to Cruickshank et al. (1975).

Catalase test: as previously described by Cruickshank et al. (1975).

Coagulase test: Coagulation of rabbit plasma was tested according to the previous description of McFaddin (1980).

Acetoin production: The procedure involved was as described previously (Cruickshank et al., 1975).

Deoxyribonuclease production (DNase): The production of deoxyribonuclease was detected by a plate technique. Development of bright rose pink colour was regarded as positive if toluidine blue was added, as described by Finegold and Martin (1982).

Egg yolk precipitation: The egg yolk reaction was studied on nutrient agar medium containing 10% egg

yolk emulsion. Opaque Zone around the colonies was regarded as positive as described by Baird-Parker (1963).

7. Fibrinolysin activity: It was demonstrated by wide zones of clearing around areas of growth in plasma agar mixture, as described by Finegold and Martin (1982).

Tellurite reduction: It was determined by appearance of black, convex shinny colonies on Vogal Johnson media as recommended by Finegold and Martin (1982).

Lipase activity: It was demonstrated by the production of clear zones of about 2-5 mm in diameter within 1-3 days of incubation in Baird-Parker media.

Novobiocin susceptibility: The disk diffusion technique was adopted according to Finegold and Martin (1982).

Detection of cell-bound protein A of the isolated strains: Staphylococcal protein A (SPA) was detected by slide co-agglutination methods (Kessler, 1975). A new latex agglutination system (Staphaureux Wellcome foundation) was also utilized for possible correlation.

Lysozyme production: Lysozyme production was determined by the procedure of Seleim et al. (1981). The clearing zone around the well due to cell wall lysis indicated lysozyme production by the tested strains.

RESULTS

Of 85 samples collected from septic wounds from Camels, *Staphylococcus aureus* was isolated from 16 samples with an incidence rate of (18.8%),while 69 samples were negative (81.2%), for staphylococcal infection.

The biochemical test results of *S. aureus* isolates of camel origin are shown in **(Tabel 1)**. All strains appearted as Gram-positive cocci arranged in grapes or tetrades without any remarkable morphological difference. All strains produced catalase, and were positive in anaerobic glucose fermentation.

Properties and key features of *S.aureus* isolates from Camel:

Table (1) summarises the results of a series of tests which gave further information relevant to *S. aureus* of camel origin. Coagulase, acetoin production, mannitol and mannose fermentation , novobiocin sensitivity and lysozeyme activity were uniformly positive this finding indicates the significance of these characteristics as key feature of *S. aureus* originating from camels.

Concerning the haemolytic activity, only 10 (62.5%). Our of 16 isolates showed zones of beta-baemolysis on to 5% blood agar. The results of sugar fermentation showed that, all isolated strains of *S. aureus* were positive for mannitol and mannose. On the other hand, all isolates failed to ferment xylose, 14 strains (87.5%) were positive for sucrose and 15 strains (93.8%) fermented lactose.

The positive results for fibrinolysin, deoxyribonuclease, egg yolk precipitation, tellurite reduction and lipase activity was 37.5%, 37.5%, 75.0%, 87.5% 6.3% respectivley.

It is interesting to demonstrate that, only 1/4 (25.0%) of *S. aureus* isolates produced cell bound protein A.

Table (I)

Characteristics and test results of 16 strains of Staphylococcus aureus isolated from camels

Characteristic	Positive reaction	
	No.	%
Coagulase production	16	100.0
Acetoin production	16	100.0
Mannitol fermentation	16	100.0
Haemolytic activity	10	62.5
Fibrinolysin activity	6	37.5
Egg yolk precipitation	12	75.0
Tellurite reduction	14	87.5
Lipase activity	1	6.3
Novobiocin sensitivity	16	100.0
Lysozyme activity	16	100.0
Cell bound protein A(SpA)	4	25.0
Deoxyribonuclease	6	37.5
Sugars fermentation		
Mannitol	16	100.0
Mannose	16	100.0
Xylose	00	000
Sucrose	14	87.5
Lactose	15	93.7
Pigment production		
Golden yellow	5	31.3
Cream	10	62.5
White	1	6.3

Concordance % = $\frac{\text{Both tests positive + Both tests negative}}{\text{Total No. of isolates}} \times 100$

DISCUSSION

In this investigation, no difficulties were encountered in the recognition of the camel strains as *S. aureus*.

The routinely used tests as coagulase and mannitol fermentation were uniformly positive. These two characters were completely paralleled by production of lysozyme, acetion, novobiocin sensitivity and mannose fermentation. These characteristics considered to be typical and key features for *S. aureus* originating from camels. No comperhensive study has yet been published on the characteristics of *S.aureus* of camel origin to be discussed here. The species identity of *S. aureus* from bovine and human origin studied by various investigators showed variable test results regarding the properties, concerned.

It is worthy to mention here that Protein A was demonstrated in 25% of *S. aureus* isoaltes of camels, in this concern, protein A has been found to occur regularly in human *S.aureus* strains, (Weiss et al., 1984), less frequently in bovine strains (Oeding and Grov, 1972) and occasionally in swine strains. (Oeding et al., 1972). Strain belonging to other *S. aureus* origins do not seen to contain protein A (Devriese and Oeding, 1976).

To our knowledge this is the first report on the occurrence of protein A in *S. aureus* strains isolated from camels.

SUMMARY

Staphylococcus aureus strains originating from, Camels were characterised according to the proposed Scheme of Sneath et al. (1986).

Characteristcis of 16 isolates secured from 85 septic wound swabs showed that, coagulase test, acetoin production from glucose, mannitol and mannose fermentation, novobiocin sensitivity and lysozyme activity were uniformly positive, accordingly these tests were regarded as essential features for *Staphylococcus aureus* originated from camels.

Determination of the occurrence of cell wall protein A (SPA) in *S.aureus* by a new latex agglutination system showed that, only 4 strains (25.0%) produced cell bound protein A.

Concordance between coagulase test results and other criteria was 100%, acetoin production, mannitol and mannose fermentation, novobiocin sensitivity and lysozyme production, 87.5% (tellurite reduction), 75.0% (egg-yolk precipitation, 37.5% (DNase),37.5% (fibrinolysin) 25% (SPA) and 6.3% (lipase).

REFERENCES

1. Baird-Parker, A.C. (1963): A classification of micrococci and staphylococci based on physiological and biochemical tests. J. Gen. Microbiol., 30, 409-427.

2. Cruickshank, R.; Duguid, J.P.; Mormion, B.P. and Swain, R.H.A. (1975): Medical Microbiology, 12th. Ed. Vol. II. Churchil Livingstone, Edinburgh, London and New York.

3. Devriese, L.A. and Oeding, P. (1976): Characteristics of *S. aureus* strains isolated from different animal species. Res. Vet. Sci., 21, (3),284-291.

4. Finegold, S.M. and Martin, W.J. (1982): Baily and Scott's Diagnostic microbiology. 6th. Edt. The C.V. Mosby Company, St. Louis, Toronto, London.

5 . Ismail, M.; Enany, M.; El-Seedy, F.R. and Shouman, M.T. (1985): Oedematous skin disease of camel in El-Sharkia Governorate. First Int. Conf. App. Sci. Vol. II, 623-631.

6 . Joklik, W.K.; Willet, H.P. and Bernard Amos, D. (1980): Zinsser Microbiology 17th. edition. Appleton century-Crofts/New York.

7 . Kessler, S.W. (1975): Rapid isolation of antigens from cells with a staphylococcal protein A antibody adsorbent. Parameters of the interaction of antibody-antigen comples with protein A J. Imm., 155 (6), 1617-1624.

8 . MacFaddin, J.E. (198=): Biochemical tests for identification of medical bacteria. 2nd. Ed. Wiliams and Wilkins Company, Baltinore, Y.S.A.

9 . Oeding, P. and Grov. A. (1972): Studies in the staphylococci, Ed. J.O. Cohen. Wiley-Interscience, N.Y.PP. 330-356.

10. Oeding, P.; Marandan, J.; Meyer, W.; Hajek, V. and Marsalek, E. (1972): Acta pathological and Microbiologia. Scandinavia, 80B 1525 Cited by Devriese and Oeding (1976).

11. Seleim, S.A., Amin, N.; Amin, M.M.; El-Saifi, A.A. and Ismail, M. (1981): Detection of lysozyme production using technique as an aid for the identification of pathogenic staphylococci causing some animal and human diseases. Arch. Exper. Vot. Med., Leipzig, 35 (2), 277-283.

12. Shaban, I.A. (1979): Some investigations on Wounds and Wound healing in an humped camel. A Thesis of Vet. Med. (Zagazig University).

13. Sneath, P.H.A.; Main, N.S.; Sharp, M.E. and Holt, J.G. (1986): Bergey, S. Manual of Systematic Bacteriology. Williams and Wilkins. Baltimore. London. Los Angeles. Sydeney.

14. Weiss, R.; Schmeer, N.; Amend, A.; Schaeg, W. and Bekheet, (1984): Detection of protein A formation by staphylococci by means of ELISA. Zent. Vet. B, 31 (6), 424-434.