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KLEBSIELLA PNEUMONIAE AS A CAUSITIVE AGENT OF PNEUMONIA AND ABSCESSIATION IN BARKI LAMBS

BY

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ABSTRACT

Klebsiella pneumoniae was incriminated in respiratory outbreaks in barki lambs in Bedouin's herds in north western coastal zone of Egypt. Morbidity and mortality reached 40% and 19 % respectively in lambs, in which respiratory signs were observed and multifocal abscesses were recorded in necropsy. *Klebsiella pneumoniae* was recovered from diseased and dead lambs. Isolated *Klebsiella pneumoniae* found to be most sensitive to Imipenem**,** Gentamycine; Amikacin and Ciprofloxacin as antimicrobial agents but resistant to Tetracycline and Co-trimoxazole. Internal multifocal abscessiation in lambs which was recorded, is found to be a major health problem as it is difficult to be diagnosed clinically and need further investigations and studies.

Keywords:

Klebsiella pneumoniae; lambs; abscessiation; Tetracycline.

INTRODUCTION

One of the respiratory pathogens affecting animals is *Klebsiella pneumoniae* which is a gram-negative, non-motile, encapsulated, facultative anaerobic, rod-shaped bacterium. It appears as a mucoid lactose fermenter on MacConkey agar **(Abbott, 1999 and Ryan and Ray, 2004)**. *Klebsiella pneumonia* has the ability to escape host defense mechanisms, colonized and survived in affected organs producing a capsular material which may inhibit phagocytosis **(Quinn *et al.,* 1994)**. Pneumonia with pulmonary abscesses caused by bacterial infection with Pasteurella multocida, Staphylococcus aureus, Arcanobacterium pyogenes, Corynebacterium pseudotuberculosis, and Klebsiella pneumoniae have been reported in sheep **(Anderson *et al.,* 2002 and Azizi *et al.,* 2013).** Pyogenic infection in sheep is a serious health problem, and can even cause death of the affected animal **(Addo and Dennis, 1977**). Lung abscesses are common in sheep and characterized by poor body conditions, dullness and depression

combined with the usual respiratory manifestations **(Abubakr *et al.,* 1981)** but generally, it is difficult to be diagnosed clinically.

MATERIAL AND METHODS

Animals;

One hundred lambs from three different neoubhouring sheep herds at Sidi Barrani city, Matrouh governorate were examined for pneumonia and respiratory signs, out of them 40 were diseased with different respiratory manifestations and 19 were died with history of the same signs. All diseased and 5 out of 19 dead lambs were examined bacteriologically for *Klebsiella pneumonia.*

Samples:

Thirty five nasal swabs from clinically diseased lambs and 15 swabs from pneumonic lung tissues, and abscesses content of the 5 newly dead lambs during necropsy were taken and examined bacteriologically for *Klebsiella pneumonia* under aseptic conditions.

Bacteriological examination:

Different swabs were aseptically collected and plated on blood and MacConkey media, and incubate aerobically at 37°C. Culture plates were examined daily for 3 days. The growth was classified as heavy, moderate, and light (Three or less colonies were considered insignificant, most probably contaminant). Primary isolated and suspected colonies were sub cultivated to obtain pure cultures, and were identified as *Klebsiella pneumoniae* based on standard procedures such as colonial morphology, Gram stain and classical biochemical characteristics **(**Cytochrome oxidase, catalase, indole production, urease production,sulfhydric acid production on T.S.I.medium (Oxoide) and oxidation / fermentation tests **(Quinn *et al.,* 1994).** The antimicrobial susceptibility testing was carried out by disk diffusion test, using standard antimicrobial discs (Oxoid) of Imipenem (10 µg), Gentamycin (10 µg), Amikacin (30 µg), Ciprofloxacin (5 µg), Co-trimoxazole (25 µg) and Tetracycline (30 µg). After preparation of the standardized inoculum with sterile nutrient broth (density 0.5 McFerland), Muller Hinton agar (Oxoid) plate was inoculated with even distribution of the bacterial suspension all over the plate. Then using the pointed forceps, the antimicrobial discs were applied onto the surface of inoculated plate which was then incubated at 37°C for 24 hours. The degree of susceptibility was determined by measuring of the zone of growth

inhibition (in mm) and the results were interpreted according to the CLSI (formerly NCCLS) standard **(CLSI, 2010).**

RESULTS AND DISCUSSION

Clinical signs of the animals under study started with nasal discharges, fever, high respiratory rates and anorexia and continued to loss of weight, dullness and recumbence till death if not respond to treatments. Post-mortum lesions were pneumonic lesions with moderate edema and multifocal caseous abscessiation in lungs, pleura, chest wall and some internal organs as liver as showed in photo (1, 2and 3).

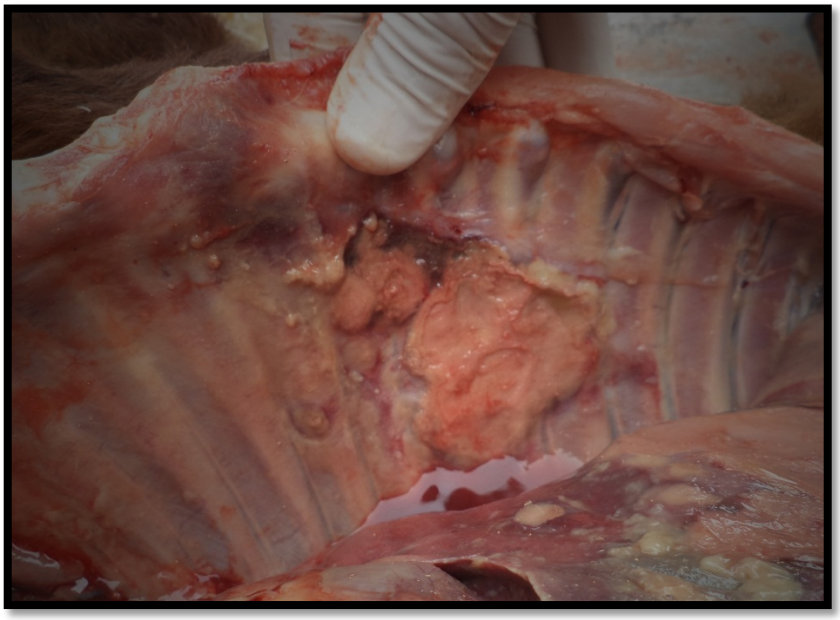

Photo (1)

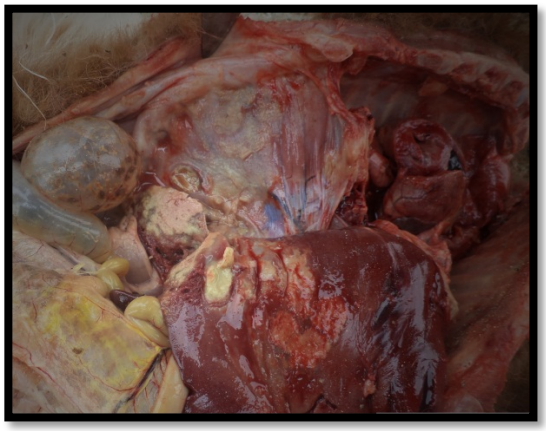

Photo (1)

Photo (2)

Klebsiella pnemoniae was isolated from 14 out of 35 different nasal swabs (40%) from diseased lambs in agreement with that obtained by **Saleh and Tamer (2014)**. On the other hand, **Donia *et al.* (2014)** reported that, *Klebseilla pneumoniae* was the most dominant isolate (27.3 %) from sheep with respiratory manifestations. They added that, *Klebseilla pneumoniae* infection is characterized by presence of metal ions (a virulence factor) which is highly crucial for its survival. In this study we isolated *kliebsiella pneumonia* from abscesses content found not only in lungs and its surrounding tissues but also in other internal organ (liver) of all examined dead lambs confirming the hematogenous spread way of this microorganism as previously mentioned by **Radostits *et al.*, (2007)** as, large numbers of small abscesses can develop simultaneously in different body organs and tissues when hamatogenouus spread occurred**.** Also, *Klebsiella pneumoniae* has been known to cause lung abscesses in adult sheep as recorded by **Azizi *et al.* (2013)** who isolated *Klebsiella pneumoniae* from the pulmonary abscesses of slaughtered sheep in Iran. **Gameel *et al.* (1991)** recovered *Klebsiella pneumoniae* subspecies *ozaenae* from small nodules on the chest wall and lungs of sheep slaughtered in Al-Ahsa abattoir, Saudi Arabia. In addition, **Boguta *et al.* (2002)** identified *Klebsiella pneumonia* and *Escherichia coli* from purulent bronchopneumonia of foal necropsy. On the other hand, **Hatem *et al.*, (2013)** concluded that, further investigations may be needed to ensure if *Klebsiella* spp. has ability to induce abscess itself or it comes as a secondary infection following the primary one since they did not isolate *Klebsiella pneumoniae* in pure culture in any examined abscess. The host range and outbreaks of *Klebsiella pneumonia* was noticed also by **Bowring *et al.*, (2017)** who recorded that, *Klebsiella pneumoniae* causing septicaemia outbreaks in neonatal pigs. Isolation of Klebsiella pneumoniae from pulmonary and hepatic abscesses of lambs in this study goes hand to hand with the human findings of **Fang *et al.*, (2004),** who found that, *klebsiella pneumonia* is a common cause of lung and liver abscesses in immune-compromised human patients with chronic diseases.

The results in (Table 1), shows the susceptibility of isolated *Klebsiella* strain to many antimicrobial agents, including Imipenem, Gentamycin, Amikacin and Ciprofloxacin but the resistance to Co-trimoxazole and Tetracycline were observed. The results obtained revealed that, the best antibiotic was Ciprofloxacin with 32 mm inhibition zone, while tetracycline was the worst one with inhibition zone 5mm. These results are agreed with **Kim *et al.*, (2005),**

Wu *et al*., (2012) and Davies *et al.,* (2016) who noticed high levels of resistance to Sulphonamides and Tetracycline and concluded that, the potential of this pathogen need more monitoring.

Table (1): The zone of inhibition (mm) of *K. pneumonia* against antimicrobial agents.

Antimicrobial agent	Concentration in the disk (g)	Zone of inhibition (mm)	Interpretation of results (CLSI formerly NCCLS standard)		
			Resistant	Intermediate	Susceptible
Imipenem	**10 g**	**27**	**≤13**	**14-15**	**≥16**
Gentamycin	**10 g**	**16**	**≤12**	**13-14**	**≥15**
Amikacin	**30 g**	**20**	**≤14**	**15-16**	**≥17**
Ciprofloxacin	**5 g**	**32**	**≤20**	**21-30**	**≥31**
Co-trimoxazole	**25 g**	**7**	**≤10**	**11-15**	**≥16**
Tetracycline	**30 g**	**5**	**≤11**	**12-14**	**≥15**

In conclusion, Isolation of *Klebsiella pneumoniae* from internal abscesses and pneumonic lung tissues of newly born lambs confirm the ability of this microorganism to circulate and colonized in some internal organs producing multifocal lesions stimulating the immunological and body defense mechanisms.Therefore, focusing the attention on molecular characterization of its strains, the immunological responses and the way of treatment with specific antibiotics is needed in further studies.

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