Table 1 Primer sequences used for PCR amplification for bacterial species causing pneumonia in small ruminants

Bacterial species	Target Gene	Primer	Sequence (5'→3')	Amplicon size (bp)	References
Mannheimia haemolytica	*sodC*	Forward Reverse	AAGGTGGCAAGCTCACAGCAG TGAGTGGTTATCGCCGCCT	230	Ewers (2008)
Pasteurella multocida	*KMT1*	Forward Reverse	ATCCGCTATTTACCCAGTGG GCTGTAAACGAACTCGCCAC	457	Townsend et al. (1998)
Escherichia coli	*uidA*	UAL-754 UAR-900	AAAACGGCAAGAAAAAGCAG ACGCGTGGTTACAGTCTTGCG	147	Bej et al., (1990)
Klebsiella pneumonia	*gyrA*	Forward Reverse	CGCGTACTATACGCCATGAACG TA CGCGTACTATACGCCATGAACG TAACCGTTGATCACTTCGGTCAG G	441	Brisse and Verhoef (2001)
Staphylococcus aureus	*nuc*	Forward Reverse	GCGATTGATGGTGATACGGTT AGCCAAGCCTTGACGAACTAAA GC	270	Louie et al. (2002)
Pseudomonas aeruginosa	*O-antigen acetylase gene.*	PA431CF PA431CR	CTGGGTCGAAAGGTGGTTGTTA TC GCGGCTGGTGCGGCTGAGTC	232	Choi et al. (2013)
Proteus mirabilis	*zapA*	Forward Reverse	ACCGCAGGAAAACATATAGCCC GCGACTATCTTCCGCATAATCA	540	Stankowska et al. (2008)

Table 2 PCR conditions used for detection of each bacterial species in this study

PCR conditions	***M. haemolytica***	***P. multocida***	***E. coli***	***K. pneumonia***	***S. aureus***	***P. aeruginosa***	***P. mirabilis***
Initial denaturation	95°C-15min	95°C - 4min	94°C for 5min	94°C - 4 min	94°C-5min	95°C-3min	95°C-2min
Denaturation	94°C - 30Sec	95°C -1min	94°C for 10Sec	94°C- 30Sec	94°C -30Sec	95°C-1min	95°C-30 Sec
Annealing	55°C - 45Sec	55°C- 1min	55 for 10Sec	55°C - 40Sec	55°C -30Sec	63°C-30Sec	59°C-30Sec
Extension	72°C - 1min	72°C- 1min	72°Cfor 1min	72°C - 1min	72°C - 1min	72°C-1min	72°C-1min
Amplification	35 cycles	30 cycles	35 cycles	30 cycles	35 cycles	35cycles	30 cycles
Final extension	72°C-10min	72°C -9min	72°C for 10min	72°C- 10min	72°C- 10min	72°C-10min	72°C-5min

Table 3 Total number and percentages of the examined animals and affected animals

Species	Number of examined animal		Affected animals	
	Total number	Total percentage%	Number	Percentage%
Sheep	3667	91.30	218	86.17%
Goat	394	9.70	35	13.83%
Total	4061	100%	253	100%

Table 4 Prevalence of isolated bacterial species from affected pneumonic lungs in sheep and goats (n=253).

No	Bacterial	No. of affected lungs		No. isolated Bacteria with percentage (%)	
		Sheep (218)	Goat (35)	Sheep	Goat
1	*Pasteurella multocida*	15	3	15 (6%)	3 (4%)
2	*Mannhaemia haemolytica*	6	2	6 (2.4 %)	2(2.6%)
3	*Staphylococcus aureus.*	66	9	85(34 %)	30 (40%)
4	*Escherichia coli*	47	7	55 (22%)	15 (20%)
5	*Klebsiella pneumonia*	10	3	12 (4.8%)	3 (4%)
6	*Pseudomonous* spp.	1	1	2 (0.8%)	2 (2.6%)
7	*Proteus* spp.	5	2	7 (2.8 %)	3 (4%)
8	*Staphylococcus aureus* and *E. coli*	40	5	40 (16%)	10 (13.33%)
9	Negative for Bacterial isolation	28	5	28 (11.2)	5 (6.94%)
10	Total	218	35		

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Supplementary file

Table 5 The biochemical investigation results for all isolated bacteria from pneumonic lungs

Isolated bacteria	Biochemical reactions of isolated bacteria												
	Gram's reaction	Motility	Catalase	Oxidase	Simmon Citrate	Urease	Indole	Methyl red	Vogas-.	Lactose	Triple sugar Iron Agar Slope Butt	H_2S	Gas
P. multocida	G-	-	+	+	-	-	+	-	-	-	N/A	-	-
M. haemolytica	G-	-	+	+	-	-	-	-	-	+	N	-	-
S. aureus.	G+	-	+	+	-	-	-	+	+	-	N	-	+
E. coli	G-	+	+	-	-	-	+	+	-	+	Y/Y		
K. pneumonia	G-	-	+	-	+	-	-	-	+	+	Y/Y	-	+
Pseudomonas spp.	G-	+	+	+	+	-	-	-	-	-	R/Y	-	-
Proteus spp.	G-	+	+	-	_	+	-	+	+	-	R/Y	+	+

Table 6 Characteristics of isolated bacteria from pneumonic lungs in different culture media.

No.	Isolated bacteria	Blood Agar	MacConkey Agar	Mannitol Salt Agar
1	*Pasteurella multocida*	Gamma-hemolytic, round smooth or mucoid. Gram negative coccobacilli	No growth	No growth
2	*Mannhaemia haemolytica*	B-hemolytic, Gram-negative, non-motile, small rod- coccobacilli. Bipolar stained with Gram's stain, smooth and greyish colony (1-2 mm width)	Growth	No growth
3	*Staphylococcus aureus* .	β-heamolytic ,Gram positive cocci	No growth	Golden yellow colonies with yellow zones
4	*Escherichia coli*	Beta (β) heamolytic, Gram-negative, big, circular, gray and moist colony.	Colonies are circular, moist, smooth and of entire margin, flat and pink colored, lactose fermenting.	No growth
5	*Klebsiella pneumonia*	Non- hemolytic (gamma-hemolytic), mucoid colonies.	Gram-negative, non-motile, encapsulated, lactose fermenting, facultative anaerobic, rod shaped and mucoid colonies	No growth
6	*Pseudomonous spp.*	Weak alpha hemolysis	Gram-negative, rod shaped, colorless colony due to the lack of lactose fermenting.	No growth
7	*Proteus* spp.	Gram-negative rod-bacilli, Swarming growth of *Proteus* on chocolate agar and (gamma-hemolytic) on blood agar, motile, aerobic and facultative anaerobic.	Pale or colorless (NLF) colonies	No growth