



Treatment of Urinary Tract Infections in sows associated with *Escherichia coli*

Radeloff, Isabel¹ Hellmann, Klaus¹ Greife, Heinrich² Stephan, Bernd²
 1. KLIFOVET AG, Muenchen, Germany; 2. Bayer Animal Health GmbH, Leverkusen, Germany

Introduction

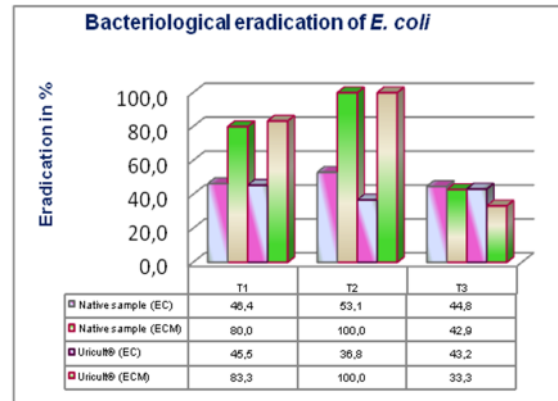
Urinary tract infections (UTI) are a major health concern in breeding herds and one of the major causes of death or culling of female breeding pigs. Infections may be caused by ascending bacterial pathogens from the external genitalia to the bladder and kidneys as a consequence of coitus and parturition, and incomplete closure of the vulva and/or damaged or relaxed urethra. Beside pathogens like *Escherichia* (*E.*) *coli*, *Streptococcus*/*Staphylococcus*/*Klebsiella*/*Pseudomonas*/*Aeromonas*/*Bacteroides* spp. and *Actinobaculum suis*, also intensive housing conditions, type of housing (e.g. dog-sitting position) and low hygiene standards are part of the multifactorial picture of UTI.

Materials and methods

Farms in Germany, the Netherlands and Slovenia with a history of UTI in sows were included in the clinical trial. Housing and management conditions were maintained unchanged during the trial.

	T1	T2	T3
Groups	Enrofloxacin (Baytril® 10%)	Enrofloxacin (Baytril® 10%)	Amoxicillin (Diphamox® LA)
Dose mg/kg bw	5.0	5.0	15.0
Regimen	three times, 24hrs apart	twice, 48hrs apart	twice, 48hrs apart
Animals analysed (enrolled)	56 (69)	50 (65)	51 (67)
Inclusion	≥10 ⁵ colony forming units (cfu)/mL mid-stream urine; abnormal macroscopic appearance (pH≥8.0 or smell or cloudiness)		
Days	Inclusion (day 0), day 3 and 14 (completion)		
Success criterion	<i>E. coli</i> positive animals (day 0) becoming negative on day 14 (<10 ⁵ cfu/mL in both, Uricult® system and urinary analysis, no <i>E. coli</i> found)		
Further parameters	Macroscopic Urine Score (MUS) = sum score of cloudiness (0 to 3) + foul smell (0 to 2)		
Diagnostics	Bacterial counts, isolation and identification using urine analysis of a native sample and the Uricult® dip stick agar system.		

Results



EC=*E. coli* in general; ECM=*E. coli* mucoid growth

At inclusion, *E. coli* was identified in 75.2% of the positive animals. Thereof, 56.7% were *E. coli* without showing hemolysis or mucoid growth, 0.6% hemolytic *E. coli* and 17.8% mucoid *E. coli*.

When comparing the percentage eradication rates of all *E. coli* isolated and *E. coli* of mucoid growth, a 30-60% higher eradication rate was seen for mucoid *E. coli*.

The MUS showed a significant reduction ($p < 0.05$) within each treatment group compared to inclusion 3 and 14 days after treatment initiation.

Discussion

Uropathogenic strains (UPEC) of *E. coli* are characterized by the expression of distinctive bacterial properties, products, or structures referred to as virulence factors helping the organism overcome host defenses and colonize or invade the urinary tract. Mucoid strains develop a capsule which is an important virulence factor, defending UPEC by antiphagocytic surface properties and against immune responses. In human surveys, non-mucoid strains of *E. coli* were not found in non-clinical cases but were isolated from cases suffering from UTI.

The virulence factor of mucoid growth enables the *E. coli* to more efficiently adhere to and damage bladder epithelium than *E. coli* strains without virulence factors. It is postulated that a higher percentage of the non-specified *E. coli* isolates in our study had no virulence factors and were part of the normal non-pathogenic flora of the vaginal and anal region. They were washed-out while catching the mid-stream urine but could not be eliminated by antimicrobial therapy due to the continuous re-colonization.

The low efficacy of the control product (amoxicillin without clavulanic acid) in both, the *E. coli* strains in general and the mucoid strains is thought to be due to the beta-lactamase-secreting activity of *E. coli*.

Based on the results observed, Baytril® 10% Injectable Solution, used as an antimicrobial therapy for sows suffering from urinary tract infection associated with *E. coli*, was shown to reduce the infection pressure on animal and farm level for UPEC. Therapy with Baytril® 10% can help to interrupt infection cycles and should be part of an eradication program including improvement of housing conditions, herd management and hygiene standards for breeding animals (sows, boars) as well as of gestation programs in sows and gilts.

References

- Raksha, R., Srinivasa, H. and Macaden, R.S. (2003): Occurrence and Characterisation of Uropathogenic *Escherichia coli* in Urinary Tract Infections. *Indian Journal of Medical Microbiology*, (2003) 21 (2):102-107
- Todar, K. (2008): Pathogenic *E. coli*. *Todar's Online Textbook of Bacteriology*. <http://www.textbookofbacteriology.net>
- Carr, J. and Walton, J. R. (1993): Bacterial flora of the urinary tract of pigs associated with cystitis and pyelonephritis. *Vet Rec*, 132: 575-577
- Fairbrother, J. M. (2006): Urinary Tract Infection. In: *Diseases of Swine*. 9th edition, Blackwell Publishing Ltd, Oxford, UK, pp. 671-674

Acknowledgments

The authors thank P. Kopp and C. Hafner for the diagnostic part (VetMedLabor, Division of IDEXX, Germany), the investigators D. Homann, C. Sudendey, K. Pfannes, M. Ritter, J. Beisl (Germany) and T. Gider (Slovenia) as well as P. Klein for the statistical analyses (dsh statistical service GmbH, Germany). The clinical field study reported herein was performed in compliance with the current national laws and regulations.