Study of the presence of *blaTEM*, *blaSHV* and *blaCTX-M* genes in *Escherichia coli* strains isolated from sheep in Kerman province

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Abstract

The aim of this study was to the determination of prevalence of resistant Escherichia coli isolates to commonly used β-lactam antibiotics and some related resistance genes in sheep. Totally, 67 E. coli isolates from 67 healthy sheep were considered to determine resistance against 9 antibiotics belonging to commonly used beta-lactam antibiotics by disc diffusion method. Also, the presence of blaTEM, blaSHV and blaCTX-M genes was investigated by PCR. The results showed all isolates were resistant to at least one of the tested antibiotics. The high prevalence of resistant strains to cephalexin, cefotaxime and ceftazidime was 98.5%, 98.5% and 97%, respectively. Also, 5 samples (7.4%) were positive for ESBLs producing E. coli. The results of this study indicated an increasing rate of resistance to commonly used β-lactam antibiotics among sheep. Therefore, antibiotic prescription methods should be limited and prevention strategies should be considered against infections to avoid dissemination of antibiotic resistance in food-producing animals.

Key word: β-lactam, antibiotic resistance, *Escherichia coli,* ESBLs

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Refrences

Adefarakan, T. A., Oluduro, A. O., David, O. M., Ajayi, A. O., Ariyo, A. B., & Fashina, C. D. (2014). Prevalence of antibiotic resistance and molecular characterization of Escherichia coli from faeces of apparently healthy rams and goats in Ile-Ife, Southwest, Nigeria. *Ife Journal of Science*, *16*(3), 447-460.

Aliasadi, S., & Dastmalchi Saei, H. (2015). Fecal carriage of Escherichia coli harboring extended-spectrum beta-lactamase (ESBL) genes by sheep and broilers in Urmia region, Iran. *Iranian Journal of Veterinary Medicine*, *9*(2), 93-101.

Balami, E. Y., Abdulrahman, H. I., Gashua, M. M., Galadima, H. B., & Gulani, I. A. (2018). Occurrence of Multi Drug Resistant Commensal Escherichia coli in Apparently Healthy Lambs and Kids from Maiduguri, Northeastern Nigeria. *Asian Journal of Research in Animal and Veterinary Sciences*, 1-10.

Carattoli, A. (2008). Animal reservoirs for extended spectrum β-lactamase producers. *Clinical Microbiology and Infection*, *14*, 117-123.

Erb, A., Stürmer, T., Marre, R., & Brenner, H. (2007). Prevalence of antibiotic resistance in Escherichia coli: overview of geographical, temporal, and methodological variations. *European Journal of Clinical Microbiology & Infectious Diseases*, *26*(2), 83-90.

Geser, N., Stephan, R., & Hächler, H. (2012). Occurrence and characteristics of extended-spectrum β-lactamase (ESBL) producing Enterobacteriaceae in food producing animals, minced meat and raw milk. *BMC Veterinary Research*, *8*(1), 1-9.

Kapoor, G., Saigal, S., & Elongavan, A. (2017). Action and resistance mechanisms of antibiotics: A guide for clinicians. *Journal of Anaesthesiology, Clinical Pharmacology*, *33*(3), 300.

Marshall, B. M., & Levy, S. B. (2011). Food animals and antimicrobials: impacts on human health. *Clinical Microbiology Reviews*, *24*(4), 718-733.

Mølbak, K. (2004). Spread of resistant bacteria and resistance genes from animals to humans–the public health consequences. *Journal of Veterinary Medicine, Series B*, *51*(8-9), 364-369.

WHO. (2014). *Antimicrobial resistance global report on surveillance: 2014 summary* (No. WHO/HSE/PED/AIP/2014.2). World Health Organization.

Pehlivanoglu, F., Turutoglu, H., Ozturk, D., & Yardimci, H. (2016). Molecular characterization of ESBL-producing Escherichia coli isolated from healthy cattle and sheep. *Acta Veterinaria*, *66*(4), 520-533.

Pitout, J. (2012). Extraintestinal pathogenic Escherichia coli: a combination of virulence with antibiotic resistance. *Frontiers in Microbiology*, *3*, 9.

Ramos, S., Igrejas, G., Silva, N., Jones-Dias, D., Capelo-Martinez, J. L., Caniça, M., & Poeta, P. (2013). First report of CTX-M producing Escherichia coli, including the new ST2526, isolated from beef cattle and sheep in Portugal. *Food Control*, *31*(1), 208-210.

Roschanski, N., Fischer, J., Guerra, B., & Roesler, U. (2014). Development of a multiplex real-time PCR for the rapid detection of the predominant beta-lactamase genes CTX-M, SHV, TEM and CIT-type AmpCs in Enterobacteriaceae. *PloS One*, *9*(7), e100956.

Tacconelli, E., Pezzani, M. (2019). Public health burden of antimicrobial resistance in Europe. *The Lancet Infectious Diseases, 19*(1):4-6.

Tenover, F. C. (2006). Mechanisms of antimicrobial resistance in bacteria. *The American Journal of Medicine*, *119*(6), 3-10.

CLSI. (2018). Performance standards for antimicrobial susceptibility testing. *Clinical and Laboratory Standards Institute supplement M100*.