

# Prevalensi dan Karakterisasi Extended Spectrum Beta-lactamase producing Escherichia Coli (ESBL-Ec) Di Sungai Ciliwung yang Tercemar oleh Limbah Peternakan Sapi dan Ayam = Prevalence and Characterization of Extended Spectrum Beta-lactamase producing Escherichia Coli (ESBL-Ec) In the Ciliwung River Contaminated by Cattle and Chicken Livestock Waste

Siti Zachra Fadlia Nurrachmat, author

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## Abstrak

Resistensi antimikroba (AMR) telah menjadi permasalahan global dalam beberapa tahun terakhir. Tren AMR dapat diamati dengan mengacu pada prevalensi bakteri E. coli yang memproduksi enzim ESBL Extended spectrum -lactamase (ESBL-Ec). Menurut panduan WHO berjudul Global Tricycle Surveillance ESBL-Ec, sektor peternakan merupakan salah satu sumber pencemar ESBL-Ec. Penelitian ini dilakukan dengan mengambil sampel air dari Sungai Ciliwung yang terkontaminasi oleh limbah peternakan A (titik A) dan limbah peternakan B (titik B). Bakteri E. coli dan ESBL-Ec dihitung dengan menggunakan teknik membran filtrasi dan spread plate pada media TBX dan TBX-CTX. Aktivitas ESBL dilakukan dengan uji konfirmasi melalui antibiotic susceptibility test metode Double Disk Synergy Test (DDST). Karakterisasi gen CTX-M pada ESBL-Ec dilakukan dengan metode PCR dan gel elektroforesis. Konsentrasi bakteri E. coli di titik A dan titik B  $(8,3 \pm 0,02) \times 10^4$  CFU/100 mL dan  $(8,4 \pm 0,75) \times 10^4$  CFU/100 mL. Adapun untuk konsentrasi ESBL-Ec terkonfirmasi pada titik A dan titik B adalah  $(1,5 \pm 0,16) \times 10^3$  CFU/100 mL dan  $(8,8 \pm 1,2) \times 10^2$  CFU/100 mL. Rasio ESBL-Ec terhadap E. coli untuk titik A dan B adalah 1,86% dan 1,04%. Gen yang teridentifikasi pada ESBL-Ec untuk semua sampel merupakan CTX-M grup 1 meliputi blaCTX-M-1, blaCTX-M-3, dan blaCTX-M-15. Keberadaan ESBL-Ec pada studi ini indikator bahwa sektor peternakan menjadi sumber pencemar di perairan. ESBL-Ec pada sungai berpotensi mengontaminasi manusia dan lingkungan di sekitarnya. Oleh karena itu, perlu dilakukan penanganan seperti perluasan kontrol penggunaan antibiotik, pengelolaan limbah peternakan, dan revitalisasi saluran drainase.

.....Antimicrobial resistance (AMR) has become a global problem in recent years. AMR surveillance can be done by analyzing prevalence of E. coli bacteria that produce Extended spectrum -lactamase enzymes (ESBL-Ec). According to the WHO Global Tricycle Surveillance ESBL-Ec, the livestock sector is one of the sources of ESBL-Ec contaminants. This study was conducted by collecting water samples from two sides of the Ciliwung River contaminated by livestock waste (sample A and B). E. coli and ESBL-Ec bacteria were counted using membrane filtration and spread plate techniques on TBX and TBX-CTX media, respectively. ESBL activity was confirmed by antibiotic susceptibility test using Double Disk Synergy Test (DDST) method. CTX-M gene prevalence in ESBL-Ec was characterized by PCR method. The concentrations of E. coli and ESBL-Ec in sample A and B were  $(8,3 \pm 0,02) \times 10^4$  CFU/100 mL and  $(8,4 \pm 0,75) \times 10^4$  CFU/100 mL, respectively. Whereas the confirmed ESBL-Ec concentrations in sample AN and B were  $(1,5 \pm 0,16) \times 10^3$  CFU/100 mL and  $(8,8 \pm 1,2) \times 10^2$  CFU/100 mL, respectively. Ratio of ESBL-Ec to E. coli were calculated and it was found to be 1.86% and 1.04% for sample A and B, respectively. The genes identified in ESBL-Ec were CTX-M group 1, including blaCTX-M-1, blaCTX-M-3, and blaCTX-M-15. The presence of ESBL-Ec in this study indicated that the livestock sector is one of the sources of water

pollution. ESBL-Ec in rivers has the potential to contaminate humans and the surrounding environment. Therefore, it is necessary to do prevention measures, such as controlling antibiotics usage, managing livestock waste, and revitalizing drainage channels.