

ABSTRAK

POTENSI CEMARAN BAKTERI *Escherichia coli* PENGHASIL *EXTENDED SPECTRUM BETA-LACTAMASE* PADA LIMBAH CAIR RUMAH POTONG HEWAN RUMINANSIA DI PROVINSI DAERAH ISTIMEWA YOGYAKARTA

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Limbah cair rumah potong hewan (RPH) ruminansia mengandung bahan organik tinggi dan berpotensi menjadi *reservoir Escherichia coli* penghasil Extended Spectrum Beta-Lactamase (ESBL) yang dapat menyebarkan resistensi antimikroba ke lingkungan. Penelitian ini bertujuan mengetahui potensi cemarkan *E. coli* penghasil ESBL pada limbah cair RPH ruminansia di Daerah Istimewa Yogyakarta (DIY). Sebanyak 47 sampel limbah cair dikoleksi dari tiga RPH, yaitu RPH Giwangan, RPH Mancasan, dan RPH Kentungan, selama tiga bulan (Januari sampai dengan Maret 2026) mengikuti protokol WHO Global Tricycle Surveillance. Sampel diisolasi pada media Tryptone Bile X-glucuronide Agar yang disuplementasi cefotaxime 4 µg/mL (TBX-CTX), dikonfirmasi sebagai *E. coli* melalui media MacConkey, pengecatan Gram, dan uji biokimia, kemudian dikonfirmasi sebagai penghasil ESBL menggunakan *Double Disk Synergy Test* (DDST). Dari 32 koloni yang dikonfirmasi, 23 isolat ditetapkan sebagai *E. coli*, dengan mayoritas (24 isolat; 75%) bersifat sitrat negatif sesuai profil biokimia khas *E. coli*, sedangkan delapan isolat (25%) menunjukkan reaksi sitrat positif sehingga dieksklusi dari penetapan spesies *E. coli*. Hasil penelitian menunjukkan bahwa dari 23 isolat *E. coli* yang diuji, sebanyak 15 isolat (65,2%) terkonfirmasi sebagai penghasil ESBL, terdiri atas 9 isolat (60%) dari RPH Giwangan dan enam isolat (40%) dari RPH Kentungan, sedangkan pada RPH Mancasan tidak ditemukan isolat penghasil ESBL. Isolat positif terkonsentrasi pada titik *internal chamber* dan *treatment chamber*, tidak terdeteksi pada aliran sungai, dengan konsentrasi tertinggi mencapai $4,1 \times 10^9$ CFU/100 mL pada *internal chamber* RPH Giwangan. Disimpulkan bahwa limbah cair RPH ruminansia di DIY berpotensi sebagai sumber cemarkan *E. coli* penghasil ESBL sekaligus titik panas (*hotspot*) penyebaran resistensi antimikroba dalam kerangka *One Health*. Konfirmasi molekuler dan optimalisasi instalasi pengolahan air limbah disarankan untuk penelitian dan pengelolaan selanjutnya.

Kata kunci: ESBL, *Escherichia coli*, limbah cair, *One Health*, rumah potong hewan

ABSTRACT

POTENTIAL CONTAMINATION OF *EXTENDED SPECTRUM BETA-LACTAMASE* PRODUCING *Escherichia coli* IN THE LIQUID WASTE OF RUMINANT SLAUGHTERHOUSES IN THE PROVINCE OF SPECIAL REGION OF YOGYAKARTA

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The liquid waste of ruminant slaughterhouses contains high organic matter and may act as a *reservoir* of Extended Spectrum Beta-Lactamase (ESBL)-producing *Escherichia coli* that can disseminate antimicrobial resistance into the environment. This study aimed to determine the potential contamination of ESBL-producing *E. coli* in the liquid waste of ruminant slaughterhouses in the Special Region of Yogyakarta. A total of 47 liquid waste samples were collected from three slaughterhouses, namely Giwangan, Mancasan, and Kentungan, over three months (January to March 2026) following the WHO Global Tricycle Surveillance protocol. Samples were isolated on Tryptone Bile X-glucuronide Agar supplemented with 4 µg/mL cefotaxime (TBX-CTX), confirmed as *E. coli* using MacConkey agar, Gram staining, and biochemical tests, and subsequently confirmed as ESBL producers using the Double Disk Synergy Test (DDST). Of 32 colonies confirmed, 23 isolates were established as *E. coli*, the majority of which (24 isolates; 75%) were citrate-negative as typically expected for *E. coli*, while eight isolates (25%) showed a citrate-positive reaction and were therefore excluded from *E. coli* species assignment. Of the 23 *E. coli* isolates tested, 15 isolates (65.2%) were confirmed as ESBL producers, comprising 9 isolates (60%) from Giwangan and six isolates (40%) from Kentungan, whereas no ESBL-producing isolates were found in Mancasan. Positive isolates were concentrated in the *internal chamber* and *treatment chamber*, were not detected in the river stream, and reached a maximum concentration of 4.1×10^9 CFU/100 mL in the *internal chamber* of Giwangan. It is concluded that the liquid waste of ruminant slaughterhouses in the Special Region of Yogyakarta is a potential source of ESBL-producing *E. coli* contamination and a *hotspot* for the spread of antimicrobial resistance within the *One Health* framework. Molecular confirmation and optimization of wastewater treatment installations are recommended for future research and management.

Keywords: ESBL, *Escherichia coli*, liquid waste, *One Health*, slaughterhouse