

INTISARI

Dalam *Enterococcus*, terdapat dua spesies utama yang sering menjadi sorotan indikator fekal, yaitu *Enterococcus faecium* dan *Enterococcus faecalis* terutama di Tsuruoka, Yamagata. Penelitian ini memiliki tujuan untuk evaluasi konsentrasi, distribusi, dan menentukan pola dinamika resistensi antibiotik pada pengolahan air limbah Kota Tsuruoka dari Januari – Desember 2018. Secara umum, sebanyak total 48 sampel air setiap masing – masing situs pengolahan dan dilakukan karakterisasi untuk mengetahui konsentrasi dan distribusi *Enterococcus faecium* dan *Enterococcus faecalis* dengan teknik *polymerase chain reaction*. Kemudian kedua bakteri tersebut diuji kemampuan resisten terhadap antibiotik berdasarkan ketentuan standar dari Clinical and Laboratory Standards Institute (CLSI), European Committee on Antimicrobial Susceptibility Testing (EUCAST), dan U.S. Food and Drug Administration (US-FDA). Konsentrasi *Enterococcus* semakin berkurang seiring berjalannya proses pengolahan air limbah dimana konsentrasi tertinggi terjadi pada situs *influent* dan *activated sludge* dengan densitas 106 - 107 CFU mL⁻¹. Dari total 1227 isolat *Enterococcus* dalam satu tahun, telah teridentifikasi *E. faecium* 41 % (508/1227), *E. faecalis* 19% (227/1227), dan spesies *Enterococcus* lain sebanyak 40 % (492/1227). Hasil uji resistensi antibiotik (resisten maupun intermediet) memberikan data resistensi tertinggi terhadap eritromisin sebanyak 69% untuk *E. faecium* dan ciprofloxacin dan grup tetrasiklina masing masing sebanyak 63% dan 45% untuk *E. faecalis*. Bakteri resisten antibiotik tidak sepenuhnya hilang setelah diolah karena dalam setiap situs pengolahan terdapat *Enterococcus* yang resisten terhadap antibiotik. Dari studi ini, bisa diketahui bahwa kehadiran *Enterococcus* resisten memberikan ancaman kepada lingkungan karena mampu melewati pengolahan air limbah meski dalam jumlah sedikit.

Kata Kunci: Resistensi Antibiotik *Enterococcus*, *Enterococcus faecium*, *Enterococcus faecalis*, *Enterococcus* dalam air limbah

ABSTRACT

Presence of resistant enterococci in wastewater indicates antibiotic resistance bacteria dissemination occurs inside the aquatic environment. Among enterococci itself, two most notable species as a major fecal indicator are *Enterococcus faecium* and *Enterococcus faecalis*. The objectives of this work were to evaluate the concentration, distribution, antimicrobial resistance patterns inside wastewater treatment plant (WWTP), particularly *E. faecium* and *E. faecalis*. In general, 48 samples were collected and representing treatment steps from influent-activated sludge-after sedimentation-effluent, from the Tsuruoka Municipal WWTP between January 2018 and December 2018. Samples were characterized to confirm the presence and the distribution number of *E. faecium* and *E. faecalis* using *polymerase chain reaction*. Antimicrobial susceptibility testing was performed by using MIC agar dilution methods based on Clinical and Laboratory Standards Institute (CLSI), European Committee on Antimicrobial Susceptibility Testing (EUCAST), and U.S. Food and Drug Administration (US-FDA) breakpoint standard. *Enterococci* concentration decreased as treatment progress with the highest concentration was in inflow and activated sludge at densities of 10⁶ - 10⁷ CFU mL⁻¹. A total of 1227 *Enterococcus* isolates were identified as *E. faecium* 41.4% (508/1227), *E. faecalis* 18.5% (227/1227), and other species 40.1% (492/1227). The higher level of antibiotic resistance (or intermediate resistance) was observed within erythromycin (69%) for *E. faecium* and within ciprofloxacin (63%) and tetracycline group (45%) for *E. faecalis*. Antibiotic-resistant enterococci were not eliminated as treatment progress since resistant enterococci found in each treatment step. This study indicates resistant enterococci could pose a threat in the environment since it could pass through WWTP despite at a low level.

Keyword: Antibiotic resistant enterococci, *Enterococcus faecalis*, *Enterococcus faecium*, enterococci in wastewater