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INTISARI

Rancang Bangun dan Validasi Alat Uji Sensitivitas Antibiotik Semi-Otomatis pada *Vibrio parahaemolyticus*

Arman Faries

Pengujian sensitivitas antibiotik metode difusi cakram yang dilakukan secara manual memiliki keterbatasan dalam hal standardisasi teknis, akurasi dan efesiensi operasional. Penelitian ini bertujuan untuk merancang, mengevaluasi kinerja mekanis, dan memvalidasi alat uji sensitivitas antibiotik semi-otomatis berbasis metode difusi cakram standar EUCAST untuk mendeteksi resistensi *Vibrio parahaemolyticus* terhadap tetracycline, oxytetracycline, dan enrofloxacin. Sistem mengintegrasikan modul otomatis untuk penyiapan media, standardisasi suspensi bakteri, inokulasi, dan penempatan cakram antibiotik. Kinerja alat dievaluasi dengan membandingkannya terhadap metode manual berdasarkan akurasi volume cairan, pembacaan densitas bakteri, homogenitas kultur, sebaran bakteri pada media agar, serta ketepatan penempatan cakram antibiotik. Validasi dilakukan menggunakan 19 strain *Vibrio parahaemolyticus* terhadap oxytetracycline, tetracycline, dan enrofloxacin (171 titik uji), dengan parameter ukuran zona hambat dan interpretasi sensitivitas antibiotik, mengacu pada sistem standar (manual). Hasil pengujian menunjukkan pompa peristaltik memiliki kesalahan volume < 1,1% dengan RSD < 2,5%). Densitometer menunjukkan linearitas tinggi (R^2 = 0,99) dan MAE 0,010 terhadap Spectroquant® Prove 300. Plate rotator menghasilkan sebaran bakteri yang homogen sedangkan disk dispenser mencapai keberhasilan jatuh 97% dengan ketepatan posisi 88%. Analisis komparatif numerik menunjukkan tidak terdapat perbedaan signifikan pada rata-rata diameter zona hambat *Tetracycline* (*p-value* = 0,509) dan *Enrofloxacin* (*p-value* = 0,803), serta perbedaan rata-rata minimal sebesar -0,85 mm pada *Oxytetracycline* (*p-value* = 0,015). Hasil numerik tersebut selaras dengan validasi fungsional terhadap 19 strain *Vibrio parahaemolyticus* yang menunjukkan tingkat *concordance* kategorial sempurna (100%) untuk *Oxytetracycline* dan *Tetracycline*, serta 94,12% untuk *Enrofloxacin* tanpa ditemukan adanya *major discrepancy* maupun *very major discrepancy*.

Kata Kunci: otomatisasi, uji sensitivitas antibiotik, *Vibrio parahaemolyticus*

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ABSTRACT

Design, Construction, and Validation of Semi-Automatic Antibiotic Sensitivity Testing Device on *Vibrio Parahaemolyticus*

Arman Faries

Manual disc diffusion antibiotic sensitivity testing has limitations in terms of technical standardization, accuracy, and operational efficiency. This study aims to design, evaluate the mechanical performance, and validate a semi-automated antibiotic sensitivity testing device based on the EUCAST disk diffusion method to detect *Vibrio parahaemolyticus* resistance to tetracycline, oxytetracycline, and enrofloxacin. The system integrates automated modules for media preparation, bacterial suspension standardization, inoculation, and antibiotic disc placement. The device's performance was evaluated by comparing it to the manual method based on the accuracy of liquid volume, bacterial density readings, culture homogeneity, bacterial distribution on the agar medium, and the accuracy of antibiotic disc placement. Validation was carried out using 19 *Vibrio parahaemolyticus* strains against oxytetracycline, tetracycline, and enrofloxacin (171 test points), with the parameters of the size of the inhibition zone and interpretation of antibiotic sensitivity, referring to the standard (manual) system. The test results showed that the peristaltic pump had a volume error of <1.1% with an RSD of <2.5%). The densitometer showed high linearity (R^2 = 0.99) and MAE 0.010 against Spectroquant® Prove 300. The plate rotator produced a homogeneous bacterial distribution while the disc dispenser achieved 97% drop success with 88% positioning accuracy. Numerical comparative analysis showed no significant difference in the average inhibition zone diameter of Tetracycline (p-value = 0.509) and Enrofloxacin (p-value = 0.803), and a minimal average difference of -0.85 mm for Oxytetracycline (p-value = 0.015). These numerical results are in line with functional validation of 19 Vibrio parahaemolyticus strains which showed a perfect categorical concordance rate (100%) for Oxytetracycline and Tetracycline, and 94.12% for Enrofloxacin without any major or very major discrepancy.

Keywords: antimicrobial susceptibility testing, automation, *Vibrio parahaemolyticus*