Deteksi Mutasi Gen *rpoB* pada *Rifampicin Resistant Tuberculosis* (RR-TB) Isolat Lokal Indonesia Menggunakan *Single Pass Sequencing*

Skripsi

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ABSTRACT

DETECTION OF rpoB GENE MUTATIONS IN RIFAMPICIN-RESISTANT TUBERCULOSIS (RR-TB) LOCAL ISOLATES FROM INDONESIA USING SINGLE PASS SEQUENCING

By

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Tuberculosis (TB) remains a global challenge, particularly in Indonesia, which ranks second in the world for the highest number of TB cases. Mutations in the rpoB gene of Mycobacterium tuberculosis (Mtb) are the primary cause of resistance to rifampicin, a first-line TB antibiotic. This study aimed to detect rpoB gene mutations in local RR-TB isolates from Indonesia using Single Pass Sequencing.

Sputum samples from presumptive RR-TB patients were collected from Padang (5 samples) and Yogyakarta (1 sample). DNA was isolated and amplified via PCR. Only two samples were further processed for mutation analysis using Single Pass Sequencing. The results revealed two nonsynonymous missense mutations in codon 450 of the rpoB gene: S450L in the Padang sample and S450W in the Yogyakarta sample. Sequencing peaks were analyzed using Geneious Prime software, and base quality was assessed via Phred Score interpretation.

The S450L mutation exhibited a low Phred Score ($Q < 20$), while S450W showed high-quality sequencing ($Q \geq 40$). Both mutations disrupt rifampicin's affinity for RNA polymerase, contributing to drug resistance. This study provides insights into the mutational variants of the rpoB gene in Mycobacterium tuberculosis from local Indonesian isolates, enhancing understanding of rifampicin resistance mechanisms in the region.

Keywords: *Mycobacterium tuberculosis, Resistance, Rifampicin, PCR, Sequencing, Mutation.*

ABSTRAK

DETEKSI MUTASI GEN *rpoB* PADA *RIFAMPICIN RESISTANT TUBERCULOSIS* (RR-TB) ISOLAT LOKAL INDONESIA MENGGUNAKAN *SINGLE PASS SEQUENCING*

Oleh

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Penyakit tuberkulosis (TBC) menjadi tantangan global saat ini, terutama di Indonesia yang menempati peringkat kedua kasus TB tertinggi di dunia. Mutasi pada gen *rpoB Mycobacterium tuberculosis* (Mtb) merupakan penyebab utama resistensi terhadap rifampisin, antibiotik lini pertama TB. Penelitian ini bertujuan mendeteksi mutasi gen *rpoB* pada isolat lokal RR-TB di Indonesia menggunakan *Single Pass Sequencing*.

Sampel sputum pasien presumtif RR-TB diambil dari Padang (5 sampel) dan Yogyakarta (1 sampel). DNA diisolasi dan diamplifikasi dengan PCR. Hanya 2 sampel yang dilanjutkan untuk analisis mutasi dengan *Single Pass Sequencing*. Hasil menunjukkan dua mutasi *nonsynonymous missense* pada kodon 450 gen *rpoB*, yaitu S450L pada sampel Padang dan S450W pada sampel Yogyakarta. Peak dibaca menggunakan software Geneious primer dan kualitas basa dinilai menggunakan *Scoring Phred interpretation*.

Mutasi S450L memiliki *Phred Score* rendah ($Q < 20$), sementara S450W memiliki kualitas tinggi ($Q \geq 40$). Kedua mutasi ini mengganggu afinitas rifampisin terhadap RNA polimerase, berkontribusi pada resistensi obat. Penelitian ini menambah wawasan mengenai varian mutasi gen *rpoB Mycobacterium tuberculosis* isolat lokal Indonesia.

Kata kunci: *Mycobacterium tuberculosis,* Resistensi, Rifampisin, PCR, Sekuensing, Mutasi.