Formulasi dan Karakterisasi Serbuk Kering Inhalasi Rifampisin-Kitosan Menggunakan L-Leusin dan/atau Amonium Bikarbonat = Formulation and Characterization of Rifampicin-Chitosan Dry Powder Inhalation with the Addition of L-Leucine and/or Ammonium Bicarbonate

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Abstrak

Formulasi serbuk inhalasi rifampisin dengan pembawa kitosan dapat menghantarkan lebih banyak rifampisin ke makrofag paru untuk meningkatkan efektivitas terapi tuberkulosis laten. Diperlukan serbuk rifampisin-kitosan dengan sifat aerodinamis yang baik agar dapat terdeposisi di paru-paru. Penelitian ini bertujuan untuk menghasilkan sediaan serbuk inhalasi rifampisin-kitosan dengan adanya penambahan L-leusin dan/atau amonium bikarbonat yang memiliki sifat aerodinamis yang baik dan pelepasan obat yang baik dalam medium makrofag paru. Serbuk inhalasi rifampisin-kitosan 1:1 (F1) diformulasikan dengan leusin 30% (F2), amonium bikarbonat 1,5% (F3), atau kombinasinya (F4) dan dibuat dengan metode semprot kering. Serbuk inhalasi rifampisin-kitosan yang diperoleh kemudian dikarakterisasi rendemen, kandungan lembab, ukuran partikel geometris dan aerodinamis, serta kelarutan dan profil disolusinya dalam medium simulasi paru pH 7,4 dan medium simulasi makrofag paru pH 4,5. Penambahan leusin 30% (F2) berhasil sedikit memperbaiki sifat aerodinamis serbuk rifampisin-kitosan 1:1 (F1) dengan diameter aerodinamis rata-rata sebesar 7,56 µm, fine particle fraction (FPF) sebesar 32,48%, dan persentase serbuk teranalisis sebesar 67,23%, serta meningkatkan pelepasan rifampisin dalam medium simulasi makrofag alveolar (pH 4,5) menjadi 16,07 ± 0.56% dalam 2 jam dengan peningkatan 1,33 kali dibandingkan dengan serbuk rifampisin-kitosan (F1).

.....Formulation of rifampicin inhalation powder with chitosan as a carrier could deliver more rifampicin to alveolar macrophages to to increase the effectiveness of latent tuberculosis therapy. Rifampicin-chitosan powder with good aerodynamic properties is required in order to be deposited in the lungs. This study was aimed to produce rifampicin-chitosan inhalation powder with the addition of L-leucine and/or ammonium bicarbonate with good aerodynamic properties and high drug release in simulated alveolar macrophage fluid. Rifampicin-chitosan (1:1) inhalation powder (F1) was formulated with 30% L-leucine (F2), 1.5% ammonium bicarbonate (F3), or both (F4) and prepared using spray drying method. The obtained rifampicin-chitosan inhalation powder was characterized by its powder yield, moisture content, geometric and aerodynamic particle size distribution, as well as solubility and dissolution profile in simulated lung fluid and simulated alveolar macrophage fluid. The addition of 30% L-leucine suceeded in slightly the aerodynamic properties of 1:1 rifampicin-chitosan powder (F1) with an average aerodynamic diameter of 7.56 µm, fine particle fraction (FPF) of 32.48%, and emitted fraction of 67.23%. It also showed to increase rifampicin dissolution in simulated alveolar macrophage fluid (pH 4.5) to 16.07 ± 0.56% within 2 hours with an increase of 1.33 times compared to rifampicin-chitosan powder (F1).