OPTIMASI DAN KARAKTERISASI FORMULASI *NANOSTRUCTURED LIPID CARRIER* DARI L-DOPA-SETIL PALMITAT-ASAM LINOLEAT (NLC-DCL) SEBAGAI KANDIDAT OBAT PARKINSON

SKRIPSI

Diajukan untuk memenuhi sebagian syarat memperoleh gelar sarjana sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

Disusun oleh

Salsabila Fitri Pratami

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PROGRAM STUDI KIMIA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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OPTIMASI FORMULASI NANOSTRUCTURED LIPID CARRIER (NLC) DARI L-DOPA-SETIL PALMITAT-ASAM LINOLEAT SEBAGAI KANDIDAT OBAT PARKINSON

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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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PERNYATAAN KEASLIAN SKRIPSI

Saya menyatakan bahwa skripsi yang berjudul "**Optimasi dan Karakterisasi Formulasi Nanostructured Lipid Carrier dari L-DOPA-Setil Palmitat-Asam Linoleat (NLC-DCL) sebagai Kandidat Obat Parkinson**" ini sepenuhnya adalah karya saya sendiri. Tidak ada di dalamnya yang merupakan plagiat dari karya orang lain dan saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika keilmuan yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi yang dijatuhkan kepada saya apabila kemudian ditemukan adanya pelanggaran terhadap etika keilmuan dalam karya saya ini, atau klaim dari pihak lain terhadap keaslian karya saya ini.

Bandung, Agustus 2024

Yang membuat pernyataan,

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KATA PENGANTAR

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Penelitian ini dilakukan untuk mengeksplorasi pengembangan sistem penghantaran obat, yang memungkinkan L-DOPA termuat dalam partikel-partikel kecil yang stabil dan mudah diserap oleh tubuh. Dalam penelitian ini, penulis menggunakan sistem *Nanostructured Lipid Carrier* (NLC) berbasis setil palmitat dan asam linoleat sebagai matriks untuk menyalut L-DOPA.

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ABSTRAK

L-DOPA yang merupakan obat penyakit Parkinson memiliki keterbatasan bioavaibilitas dan stabilitas, sehingga perlu dilakukan enkapsulasi L-DOPA menggunakan *sistem Nanostructured Lipid Carrier* (NLC). Penelitian ini bertujuan memperoleh formulasi optimum, karakteristik, dan nilai *entrapment efficiency* dan profil *drug release* dari produk nanoenkapsulasi L-DOPA menggunakan NLC berbasis setil palmitat dan asam linoleat (NLC-DCL). Sintesis sistem NLC untuk L-DOPA dilakukan dengan menggunakan metode homogenisasi panas dan ultrasonikasi, serta optimasi berdasarkan 2 variabel, yaitu perbandingan komposisi lipid dan massa surfaktan. Karakterisasi NLC-DCL meliputi penentuan ukuran partikel, indeks polidipersitas, dan zeta potensial menggunakan PSA, morfologi partikel menggunakan TEM, gugus fungsi menggunakan FTIR. Penentuan *entrapment efficiency* dan profil *drug release* dilakukan menggunakan spektrofotometer UV-Vis. Hasil penelitian menunjukkan, formulasi terbaik NLC-DCL terjadi pada komposisi setil palmitat dan asam linoleat 4:6 dengan massa surfaktan sebesar 1,25 gram. Produk NLC-DCL yang diperoleh memiliki ukuran partikel rata-rata sebesar 87,9 nm dengan indeks polidipersitas sebesar 0,185, dan zeta potensial yang terukur sebesar -28,3 mV. Hasil karakterisasi FTIR menunjukkan terjadinya pergeseran pada serapan gugus O-H, N-H, C=O, dan C-O yang mengindikasikan adanya interaksi antara L-DOPA dengan setil palmitat dan asam linoleat. Hasil analisis menggunakan TEM menunjukkan bentuk NLC-DCL spherical dengan kisaran ukuran sebesar 87,5 nm. Persentase *entrapment efficiency* dari NLC-DCL diperoleh sebesar 75,49%. Profil *drug release* NLC-DCL menunjukkan pelepasan L-DOPA pada 7 jam pertama mengikuti model Korsmeyer-Peppars. Setelah 24 jam, L-DOPA dilepaskan sebanyak 26,68% pada pH 1,2 dan 36,49% pada pH 7,4.

Kata kunci: L-DOPA, *Nanostructured Lipid Carrier*, Setil Palmitat, Asam Linoleat, Penyakit Parkinson

ABSTRACT

L-DOPA, a drug used for Parkinson's disease, has limitations in bioavailability and stability, necessitating its encapsulation using the Nanostructured Lipid Carrier (NLC) system. This study aims to obtain the optimum formulation, characteristics, entrapment efficiency, and drug release profile of L-DOPA nanoencapsulation products using NLC based on cetyl palmitate and linoleic acid (NLC-DCL). The NLC system synthesis for L-DOPA was carried out using the hot homogenization and ultrasonication method, with optimization based on two variables: the lipid composition ratio and the surfactant mass. NLC-DCL characterization includes determining particle size, polydispersity index, and zeta potential using PSA, particle morphology using TEM, and functional groups using FTIR. Entrapment efficiency and drug release profiles were determined using a UV-Vis spectrophotometer. The results showed that the best NLC-DCL formulation occurred at a cetyl palmitate and linoleic acid composition ratio of 4:6 with a surfactant mass of 1.25 grams. The obtained NLC-DCL product had an average particle size of 87.9 nm with a polydispersity index of 0.185, and a measured zeta potential of -28.3 mV. FTIR characterization results showed shifts in the absorption of O-H, N-H, C=O, and C-O groups, indicating interactions between L-DOPA and cetyl palmitate and linoleic acid. TEM analysis results showed that NLC-DCL had a spherical shape with a size range of 87.5 nm. The entrapment efficiency percentage of NLC-DCL was 75.49%. The drug release profile of NLC-DCL showed that L-DOPA release in the first 7 hours followed the Korsmeyer-Peppas model. After 24 hours, 26.68% of L-DOPA was released at pH 1.2 and 36.49% at pH 7.4.

***Keywords**: L-DOPA, Nanostructured Lipid Carrier, Cetyl Palmitate, Linoleic Acid, Parkinson's Disease*

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