PENGEMBANGAN FORMULA DAN KARAKTERISASI *NANOSTRUCTURED LIPID CARRIERS* (NLC) KURKUMIN MENGGUNAKAN *GLYCERYL PALMITOSTEARAT, CAPRIC TRIGLYCERIDE* DAN PEG-40 *HYDROGENATED CASTOR OIL*

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ABSTRAK

Androgenetic Alopecia (AGA) merupakan jenis kebotakan yang sering terjadi pada pria dan wanita yang dipengaruhi oleh hormon *dihidrotestosteron* (DHT). Minoksidil dan finasterid merupakan terapi umum untuk pengobatan AGA. Namun, minoksidil dan finasterid dapat menyebabkan efek samping dermatologis seperti iritasi kulit, ruam, dan dermatitis kontak alergi. Karena efek samping ini, maka diperlukan pengobatan alternatif untuk mengurangi efek samping yang ditimbulkan. Kurkumin dipilih karena efek antiandrogeniknya yang dapat membantu mengatasi AGA. Kurkumin memiliki aktivitas penghambatan yang tinggi pada *steroid 5-alpha reductase* sehingga dapat menurunkan hormon DHT yang berlebih dalam tubuh. Namun, kurkumin ini memiliki banyak keterbatasan diantaranya sukar larut dalam air, bioavailabilitas yang rendah, log P 2,56-3,29 dan mudah terdegradasi sehingga efektivitas pengobatan menjadi tidak optimal. Oleh sebab itu, diperlukan suatu sistem penghantaran obat yang tepat seperti *Nanostructured Lipid Carriers* (NLC) sehingga dapat meningkatkan efektivitas biologisnya. NLC merupakan generasi kedua *nanocarrier* lipid yang memiliki keunggulan dalam meningkatkan solubilitas, stabilitas, dan kapasitas pemuatan obat dibandingkan dengan *Solid Lipid Nanoparticle* (SLN). Tujuan penelitian ini yaitu untuk memformulasikan NLC kurkumin menggunakan *Glyceryl palmitostearate*, *Capric triglyceride*, dan PEG-40 *hydrogenated castor oil.* Metode penelitian yang digunakan untuk pembuatan NLC kurkumin ini yaitu *high shear homogenization/sonicator probe*. Hasil penelitian menunjukkan bahwa NLC kurkumin memiliki karakteristik yang sesuai untuk aplikasi topikal dengan ukuran partikel yang optimal <400 nm, PdI <0,5, potensial zeta yang stabil > ±20 mV, efisiensi penjerapan >80%, dan morfologi sferis. Dengan demikian, diharapkan NLC kurkumin dapat meningkatkan stabilitas dan bioavailabilitas kurkumin untuk memaksimalkan efektivitas pengobatan AGA.

Kata kunci: NLC, Kurkumin, AGA

DEVELOPMENT OF FORMULA AND CHARACTERIZATION OF NANOSTRUCTURED LIPID CARRIERS (NLC) CURCUMIN USING GLYCERYL PALMITOSTEARATE, CAPRIC TRIGLYCERIDE, AND PEG-40 HYDROGENATED CASTOR OIL

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ABSTRACT

Androgenetic Alopecia (AGA) is a type of hair loss that commonly occurs in both men and women, influenced by the hormone dihydrotestosterone (DHT). Minoxidil and finasteride are common therapies for the treatment of AGA. However, minoxidil and finasteride can cause dermatological side effects such as skin irritation, rashes, and allergic contact dermatitis. Due to these side effects, alternative treatments are needed to reduce the adverse effects. Curcumin has been chosen for its anti-androgenic effects that may help address AGA. Curcumin exhibits high inhibitory activity on the enzyme 5-alpha reductase, which can reduce excess DHT hormone in the body. However, curcumin has several limitations, including poor solubility in water, low bioavailability, a log P of 2.56-3.29, and susceptibility to degradation, which can lead to suboptimal treatment effectiveness. Therefore, an appropriate drug delivery system, such as Nanostructured Lipid Carriers (NLC), is needed to enhance its biological effectiveness. NLC is a second-generation lipid nanocarrier that offers advantages in improving solubility, stability, and drug loading capacity compared to Solid Lipid Nanoparticles (SLN). The aim of this research is to formulate curcumin NLC using Glyceryl palmitostearate, Capric triglyceride, and PEG-40 hydrogenated castor oil. The research method used for the preparation of curcumin NLC is high shear homogenization/sonicator probe. The results indicate that curcumin NLC has characteristics suitable for topical application, with an optimal particle size of <400 nm, PdI <0.5, stable zeta potential of > ±20 mV, absorption efficiency of >80%, and spherical morphology. Thus, it is expected that curcumin NLC can enhance the stability and bioavailability of curcumin to maximize the effectiveness of AGA treatment.

***Keywords**: NLC, Curcumin, AGA*