

# Formulasi nanosuspensi kurkuminoid untuk penghantaran melalui paru sebagai pengobatan fibrosis paru idiopatik = Formulation of curcuminoid nanosuspension as pulmonary drug delivery system for therapy of idiopathic pulmonary fibrosis

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## Abstrak

Kurkuminoid merupakan ekstrak yang berasal dari *Curcuma domestica* dan telah diketahui dapat menghambat produksi TGF-Beta sebagai regulator utama fibrosis paru idiopatik (FPI). Sistem penghantaran paru dapat memfasilitasi akumulasi kurkuminoid pada paru-paru, kurkuminoid dapat dihantarkan melalui sistem penghantaran paru. Namun, kurkuminoid tidak larut di dalam air, sehingga diformulasikan menjadi nanosuspensi. Penelitian ini bertujuan untuk memperoleh formula nanosuspensi kurkuminoid (NSK) dengan karakteristik yang baik menggunakan stabilisator polimer PVP-K30 dan poloxamer-188 untuk penghantaran melalui paru. Pada penelitian ini, NSK dibuat dalam 3 formula yang divariasikan berdasarkan konsentrasi PVP-K30 yaitu 0,2% (NSK F1), 0,3% (NSK F2), dan 0,4% (NSK F3). NSK diperoleh dengan melarutkan kurkuminoid pada pelarut organik yang kemudian didispersikan ke dalam larutan polimer, kemudian diaduk menggunakan high shear homogenizer dengan kecepatan 20.000 rpm. NSK yang diperoleh dievaluasi yang mencakup penetapan kadar, ukuran partikel, indeks polidispersitas, zeta potensial, uji disolusi, dan uji stabilitas selama 2 bulan. Berdasarkan penelitian yang telah dilakukan, ketiga NSK menghasilkan nanosuspensi yang baik dengan ukuran partikel (Dv90) 198 - 237 nm; indeks polidispersitas 0,38 - 0,49; zeta potensial negatif 27,53 - 29,2 mV; dan kadar 101,88 - 101,97%. Jumlah kurkuminoid NSK yang terdisolusi pada medium simulasi cairan paru sebanyak 77,57 - 83,28%. Disolusi NSK meningkat hingga lebih dari 3,2 kali lipat pada menit ke-120 dibandingkan dispersi serbuk kurkuminoid dalam air. Pada suhu 25°C seluruh NSK masih stabil yang terlihat dari kadar kurkuminoid lebih dari 95%, sedangkan pada suhu 40°C kadar kurkuminoid turun hingga 92%. Dari penelitian dapat disimpulkan, NSK F1 merupakan formula terbaik namun menunjukkan ketidakstabilan setelah penyimpanan selama 8 minggu.

.....The pulmonary delivery system can facilitate the accumulation of curcuminoid in the lung, curcuminoid can be delivered through the pulmonary drug delivery system. However, curcuminoid is not soluble in water, so curcuminoid formulated into nanosuspension. This study aimed to obtain a curcuminoid nanosuspension (NSK) formula with good characteristic using polymer stabilizer PVP-K30 and poloxamer-188 for delivery through the lung. In this study, NSKs were prepared in 3 formula which varied based on the concentration of PVP-K30, 0.2% (NSK F1), 0.3% (NSK F2), and 0.4% (NSK F3). NSKs were obtained by dissolving curcuminoid in an organic solvent which was then dispersed into a polymer solution, then stirred using a high shear homogenizer at a speed of 20.000 rpm. The obtained NSKs were evaluated which included assay, particle size, polydispersity index, zeta potential, dissolution test, and stability test for 2 months. Based on the research, the three NSKs produced good nanosuspensions with particle sizes (Dv90) 198 - 237 nm; polydispersity index 0.38 - 0.49; negative zeta potential 27.53 - 29.2 mV; and content of 101.88 - 101.97%. The number of NSK curcuminoid that was dissolved in the simulated lung fluid medium was 77.57 - 83.28%. The dissolution of NSK increased by more than 3.2 times at 120 minutes compared to the dispersion of curcuminoid powder in water. At a temperature of 25°C, all NSK was stable as seen from

content of curcuminoid more than 95%, while at 40°C the curcuminoid content decreased to 92%. From the research, it can be concluded that NSK F1 is the best formula but shows instability after 8 weeks of storage.