

# Uji Sinergisitas Antimikroba Pada Bakteri Penyebab Jerawat Serta Formulasi Gel Kombinasi Nanopartikel Perak Dan Klindamisin = Antimicrobial Synergism Test Against Acne Bacteria and Formulation Gel Combination Silver Nanoparticle and Clindamycin

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## Abstrak

Jerawat adalah penyakit radang kronis. Patogenesis jerawat adalah multifaktorial, salah satunya akibat pertumbuhan berlebih mikroba seperti *S. aureus* dan *P. acnes*. Klindamisin merupakan antibiotik yang direkomendasikan untuk terapi jerawat tetapi penggunaannya menyebabkan berbagai efek samping seperti perubahan flora usus, kolitis pseudomembran dan meningkatkan risiko resistensi. Nanopartikel perak adalah antimikroba kuat, memiliki aktivitas spektrum luas dan memiliki kemampuan untuk mengurangi perkembangan resistensi, akan tetapi penggunaan jangka panjang dilaporkan mengakibatkan efek samping argyria. Penggunaan kombinasi antimikroba adalah strategi untuk mengurangi efek samping, meningkatkan efektivitas terapi dan menurunkan resiko resistensi. Tujuan penelitian ini untuk menentukan sifat sinergisitas antibakteri kombinasi nanopartikel perak dan klindamisin terhadap *S. aureus* dan *P. acnes* dilanjutkan formulasi, dan studi stabilitas sediaan gel. Penentuan Konsentrasi Hambat Minimum (KHM) nanopartikel perak, klindamisin dan uji sinergisme dilakukan secara mikrodilusi menggunakan 96-well microplate. Uji sinergi dilakukan menggunakan metode Checkerboard dengan menghitung nilai Fractional Index Concentration (FIC). Hasil penelitian menunjukkan nilai KHM nanopartikel perak dan klindamisin pada *S. aureus* berturut-turut 16 &#956;g/ml dan 64 &#956;g/ml sedangkan nilai KHM nanopartikel perak dan klindamisin pada *P. acnes* berturut-turut 0,5 &#956;g/ml dan 32 &#956;g/ml. Uji sinergisitas kombinasi nanopartikel perak dan klindamisin terhadap *S. aureus* dan *P. acnes* menghasilkan nilai FIC 0,75 dan 0,63 (sinergi parsial). Hasil uji sinergisitas selanjutnya dibuat formulasi gel menjadi gel formula FI, FII dan FIII. Hasil uji karakterisasi ketiga formula didapatkan gel yang memenuhi syarat farmakope dengan pemerian gel berwarna kuning pucat hingga kekuningan, homogen, memiliki nilai pH (FI = 5,95; FII = 5,81; FIII = 5,67), kandungan kadar klindamisin (FI=97,69+0,068%; FII=97,54+0,072%; FIII=94,93+1,69%) dan nanopartikel perak (FI=98,39+0,025%; FII=98,33+0,00%; FIII=102,78+0,79%) sesuai dengan spesifikasi yang ditetapkan serta stabil baik secara fisik dan kimia pada suhu 5oC+3oC dan 250C ± 20C selama 11 minggu

Acne is a chronic inflammatory disease. The pathogenesis of acne is multifactorial, one of them is caused by microbial overgrowth such as *S. aureus* and *P. acnes*. Clindamycin is the recommended antibiotics for acne therapy but the use of clindamycin causes various side effects such as changes in intestinal flora, pseudomembranous colitis and increased risk of resistance. Silver nanoparticles are potent antimicrobials, have broad spectrum activity and have the ability to reduce the development of resistance. Despite having potent activity, the long-term use of silver nanoparticles was reported to have argyria side effects. The use of antimicrobial combinations is a strategy to reduce side effects, increase the effectiveness of therapy and reduce risk of resistance. The purpose of this study was to determine the antibacterial synergy characteristics of the combination of silver nanoparticles and clindamycin against *S. aureus* and *P. acnes*, formulations and stability study in gel dosage form. Determination of the Minimum Inhibitory Concentration (MIC) of silver nanoparticles, clindamycin and synergism tests were carried out by microdilution using 96-well microplate.

Synergy test is carried out using the Checkerboard method by calculating the value of the Fractional Index Concentration (FIC). The results showed the MIC values of silver nanoparticles and clindamycin against *S. aureus* were 16 µg/ml and 64 µg/ml, respectively, while the MIC values of silver nanoparticles and clindamycin in *P. acnes* were 0.5 µg/ml and 32 µg/ml, respectively. The synergicity test of the combination of silver nanoparticles and clindamycin against *S. aureus* produced FIC values of 0,75 and 0,63 (partial synergy). The synergicity test results were then made into a gels combination of silver nanoparticles and clindamycin as formula FI, FII and FIII. The results of characterization tests for the three formulas found that gels were meet the specifications, with pale yellow to yellow colored gel, homogeneous, pH value (FI=5,95; FII=5,81; FIII=5,67), clindamycin content (FI=97,69±0,068%; FII=97,54±0,072%; FIII=94,93±1,69%) and silver nanoparticles (FI=98,39±0,025%; FII=98,33±0,00%; FIII=102,78±0,79%) and physically and chemically stable at temperature of 5°C±3°C and 25°C±20°C for 11 weeks.