# CHALCONE DERIVATIVES AS POTENTIAL ANTISEPTICS AND DISINFECTANTS

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The global market for antiseptics and disinfectants is growing rapidly, fueled by a coronavirus pandemic and a possible outbreak of infectious diseases in the future. The antimicrobial, anti-inflammatory and redox activity of chalcone (1,3-diaryl-2-propen-1-one) is well documented in the literature. The aim of this study is screening of antimicrobial activity of chalcones and their saturated derivatives as active pharmaceutical ingredients, synthesized by Claisen-Schmidt condensation (1). The redox potential of the investigated compounds was tested in the biological environment using spectrophotometric methods to determine prooxidant/antioxidant parameters. Within preformulation studies solubility and compatibility with excipients commonly used in liquid pharmaceutical dosage forms was performed. All the tested chalcones and their saturated derivatives showed satisfactory antimicrobial activity, but two saturated chalcones showed the best MIC (0.156 - 1.25 mM) and were categorized as compounds with strong bacteriostatic activity (2). Solubility of the chalcons with moderate antimicrobial activity and redox potential was higher than its minimum bacteriostatic and bactericidal concentration in all the tested solvents (ethanol, isopropyl alcohol and propylene glycol). Based on the chemical structure and predicted logP values for saturated chalcones that show stronger antimicrobial activity, better water solubility is expected. These data could be a starting point for formulations of antiseptics and disinfectants with lower concentrations of alcohol-based solvents, as the synergism between saturated chalcone and ethanol and isopropyl alcohol was previously shown. Considering the lighter color of the saturated chalcone, better aesthetic acceptability of the developed formulations is expected, since it will not stain the skin and objects during application.

**References**

1. Smith M, Jerry M. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure (8th ed.). John Wiley & Sons, Inc., 2020.
2. "The European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters. Version 10.0, 2020. http://www.eucast.org."

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# DERIVATI HALKONA KAO POTENTIJALNI ANTISEPTICI I DEZINFICIJENSI

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Globalno tržište antiseptika i dezinfekcionih sredstava ubrzano raste podstaknuto pandemijom koronavirusa i mogućim širenjem drugih zaraznih bolesti u budućnosti. Antimikrobna, antiinflamatorna i redoks aktivnost halkona (1,3-diaril-2-propen-1-ona) je dobro dokumentovana u literaturi. Cilj ove studije bio je skrining antimikrobne aktivnosti halkona i njihovih zasićenih derivata kao aktivnih farmaceutskih sastojaka, sintetisanih *Claisen-Schmidt* kondenzacijom (1). Redoks potencijal ispitivanih jedinjenja je ispitan u biosredini primenom spektrofotometrijskih metoda za određivanje prooksidantnih/antioksidativnih parametara. Sprovedena su i preformulaciona ispitivanja rastvorljivosti i kompatibilnosti sa ekscipijensima uobičajeno korišćenim u tečnim farmaceutskim oblicima. Svi testirani halkoni i njihovi zasićeni derivati su pokazali zadovoljavajuću antimikrobnu aktivnost, ali su dva zasićena halkona pokazala najbolji MIC (0,156 – 1,25 mM) i kategorisana su kao jedinjenja sa jakom bakteriostatskom aktivnošću (2). Rastvorljivost halkona sa umerenom antimikrobnom aktivnošću i redoks potencijalom bili su viši od njegove minimalne bakteriostatske i baktericidne koncentracije u svim ispitivanim rastvaračima (etanol, izopropil alkohol i propilenglikol). Na osnovu hemijske strukture i predviđene logP vrednosti za zasićene halkone koji pokazuju bolju antimikrobnu aktivnost, očekuje se i bolja rastvorljivost u vodi. Ovi podaci mogli bi da budu polazna osnova za formulisanje antiseptika i dezinfekcionih sredstava sa nižim koncentracijama rastvarača na bazi alkohola, uzimajući u obzir da je u prethodnom ispitivanju pokazan sinergizam između zasićenog halkona i etanola, kao i izopropil alkohola. S obzirom na svetliju boju zasićenog halkona, očekuje se i bolja estetska prihvatljivost razvijenih formulacija, jer neće bojiti kožu i predmete tokom nanošenja.

**Literatura**

1. Smith M, Jerry M. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure (8th ed.). John Wiley & Sons, Inc., 2020.
2. "The European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters. Version 10.0, 2020. http://www.eucast.org."

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