

# Perancangan Pabrik dan Uji Kelayakan Ekonomi Produk Fast Release Fluoride Varnish dengan Antibacterial Agent Menggunakan Kemasan Pharmaceutical Ampoule = Factory Design and Economic Feasibility Test for Fast Release Fluoride Varnish with Antibacterial Agent Using Pharmaceutical Ampoule Packaging

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## Abstrak

Di Indonesia, sekitar 93% anak usia dini mengalami karies gigi. Salah satu pencegahan karies gigi dengan menggunakan terapi fluoride. Terapi fluoride berupa fluoride varnish terbukti mampu menghambat pertumbuhan bakteri *Streptococcus mutans* dan mampu remineralisasi gigi dengan efektifitas hingga 77%. Penggunaan pernis fluoride pada anak usia dini diharapkan dapat mencegah terjadinya karies gigi. Saat ini telah dikembangkan pernis fluoride yang memiliki kemampuan pelepasan cepat. Pernis fluoride rilis cepat dapat melepaskan lebih banyak ion fluoride dalam waktu 4 jam. Tujuan dari penelitian ini adalah untuk merancang pabrik produk pernis fluoride fast release dengan bahan antibakteri menggunakan kemasan ampul farmasi dan menganalisis kelayakan ekonominya. Formulasi pernis fluoride yang digunakan terdiri dari rosin terhidrogenasi, etanol 99,7%, natrium fluorin, tween 80, minyak penyedap peppermint, DCPD-Xylitol, dan ekstrak agen antibakteri alami berdasarkan hasil penelitian sebelumnya. Agen antibakteri yang digunakan adalah ekstrak daun sirih merah dan ekstrak daun kemangi. Berdasarkan uji produksi yang dilakukan, diketahui bahwa dalam 4 jam pertama, pernis fluoride yang ditambahkan dengan agen antibakteri memiliki pelepasan ion fluorida yang lebih banyak daripada pernis fluorida lainnya. Dalam penulisan ini, proses penelitian diawali dengan perancangan proses produksi kemudian dilanjutkan dengan uji produksi skala pilot. Setelah itu akan dilakukan perhitungan ekonomis untuk menentukan kelayakan pembangunan pabrik pernis fluoride. Dalam karya ini kami menyajikan hasil desain proses dan uji produksi yang akan mencakup uji pelepasan ion fluorida dan pH pernis fluorida pelepasan cepat beserta analisis kelayakan ekonominya.

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In Indonesia, about 93% of early childhood experience dental caries. One of the prevention of dental caries by using fluoride therapy. Fluoride therapy in the form of fluoride varnish has been shown to inhibit the growth of *Streptococcus mutans* bacteria and is able to remineralize teeth with an effectiveness of up to 77%. The use of fluoride varnish in early childhood is expected to prevent dental caries. Currently, fluoride varnish has been developed which has fast release capability. Fast release fluoride varnish can release more fluoride ions within 4 hours. The purpose of this research is to design a factory of fast release fluoride varnish product with antibacterial agent using pharmaceutical ampoule packaging and analyze its economic feasibility. The fluoride varnish formulation used consisted of hydrogenated rosin, 99.7% ethanol, sodium fluorine, tween 80, peppermint flavoring oil, DCPD-Xylitol, and extracts of natural antibacterial agents based on the results of previous studies. The antibacterial agents used were red betel leaf extract and holy basil leaf extract. Based on the production test carried out, it was found that in the first 4 hours, fluoride varnish added with an antibacterial agent had more fluoride ion release than other fluoride varnishes. In this writing, the research process begins with the design of the production process and then continues with a

pilot scale production test. After that, an economic calculation will be carried out to determine the feasibility of constructing a fluoride varnish factory. In this work we present the results of the process design and production test which will include fluoride ion release test and pH of fast release fluoride varnish along with an analysis of its economic feasibility.