

Belinda, Nathania Earlene. 2020. **Sintesis dan Karakterisasi Membran PVA/Gelatin dengan Sediaan Anti-inflamasi *Ibuprofen* sebagai Biomaterial Preventif Adhesi Intraperitoneal**. Skripsi di bawah bimbingan Dr. Prihartini Widiyanti, drg., M.Kes dan Drs. Siswanto, M.Si. Program Studi S1 Teknik Biomedis, Departemen Fisika, Fakultas Sains dan Teknologi, Universitas Airlangga.

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### ABSTRAK

Tindakan operasi abdomen cenderung memicu pembentukan adhesi intraperitoneal dan komplikasi ini dinilai sebagai masalah klinis yang masih relevan dalam kasus pembedahan abdomen. Adhesi intraperitoneal dilaporkan menjadi penyebab dari 60 – 70% kasus obstruksi usus halus dan 15 – 40% infertilitas. Penggunaan *barrier* mekanis berbahan polimer telah banyak diteliti untuk menjaga permukaan yang luka agar tidak saling terhubung. *Poly(vinyl alcohol)* dan gelatin merupakan polimer larut air yang luas penggunaannya dalam bidang kedokteran. *Ibuprofen* adalah obat anti-inflamasi non-steroid (NSAID) yang telah terbukti menunjukkan efek anti-inflamasi saat dikombinasikan dengan polimer untuk mencegah adhesi. Studi ini menyajikan ulasan literatur mengenai potensi membran PVA/gelatin bermuatan *ibuprofen* sebagai biomaterial preventif adhesi intraperitoneal. Evaluasi dilakukan secara *in-vitro* melalui uji FTIR, SEM, *swelling*, degradasi, sitotoksitas, pelepasan obat dan uji tarik. Hasil uji FTIR mengindikasikan reaksi esterifikasi di antara PVA dan gelatin. Uji SEM menunjukkan permukaan halus dan struktur berpori. Pada uji *swelling*, penggunaan biopolimer seperti gelatin dapat memperbaiki kemampuan *swelling*. Pada uji degradasi, terjadi kenaikan persentase degradasi seiring penambahan konsentrasi gelatin. Uji sitotoksitas menunjukkan bahwa kedua polimer tidak sitotoksik namun dosis *ibuprofen* yang terlalu tinggi dapat melemahkan viabilitas. Hasil uji pelepasan obat menunjukkan persentase pelepasan obat kumulatif yang baik dalam durasi taut silang pendek, konsentrasi *ibuprofen* rendah (1 – 10 wt%) dan konsentrasi PVA tinggi. Pada hasil uji tarik, gelatin cenderung menurunkan kuat tarik. Berdasarkan hasil ulasan, membran PVA/gelatin bermuatan *ibuprofen* berpotensi menjadi kandidat *barrier* anti-adhesi intraperitoneal.

**Kata kunci:** adhesi intraperitoneal, *barrier* anti-adhesi, *poly(vinyl alcohol)*, gelatin, *ibuprofen*

Belinda, Nathania Earlene. 2020. **In-vitro Evaluation of Ibuprofen-loaded PVA/Gelatin Membrane to Prevent Intraperitoneal Adhesion**. Thesis under the guidance of Dr. Prihartini Widiyanti, drg., M.Kes and Drs. Siswanto, M.Si. Bachelor of Biomedical Engineering, Physics Department, Faculty of Science and Technology, Universitas Airlangga.

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### ABSTRACT

A recurrent complication after abdominal surgery is the intraperitoneal adhesion that follows during the post-operative recovery period and this is still a relevant clinical problem after abdominal surgery. Post-operative adhesion has been reported to be responsible for 60 – 70% of cases of small bowel obstruction (SBO) and 15 – 40% of infertilities. Polymer-based mechanical barriers' potential to separate the damaged surfaces from the surrounding tissue has been widely investigated. Poly(vinyl alcohol) (PVA) and gelatin are water soluble polymers that have been frequently employed in medical application. Ibuprofen is a non-steroidal anti-inflammatory drug (NSAID) that has been shown to exhibit anti-inflammatory effects when combined with polymers to prevent adhesion. This study covers a literature review of intraperitoneal anti-adhesion potential of ibuprofen-loaded PVA/gelatin membrane. In-vitro evaluation is conducted in 7 tests: FTIR, SEM, swelling, degradation, cytotoxicity, drug release and tensile test. FTIR spectra indicate the occurrence of esterification reaction of PVA and gelatin. SEM micrographs show smooth surfaces and porous structure. In the swelling test, introducing biopolymer such as gelatin into the barrier formulation can improve its swelling ability. Gelatin load also seems to enhance the degradation potentiality of material. Cytotoxicity test result evidences the nontoxicity properties of both polymers while too high a dose of ibuprofen may suppress cell viability. Drug release evaluation shows a favorable cumulative drug release in short crosslink duration, low ibuprofen concentration (1 – 10 wt%) and higher PVA concentration. Tensile test results signify that gelatin can decrease material tensile strength. Based on the review, ibuprofen-loaded PVA/gelatin membran shows to be a potential candidate for intraperitoneal anti-adhesion application.

**Keyword(s):** intraperitoneal adhesions, anti-adhesion barriers, poly(vinyl alcohol), gelatin, ibuprofen