

INTISARI

Ekspresi Relatif mRNA *CCL2*, *CCR2*, dan *IL10* Paru-paru Tikus Putih (*Rattus norvegicus* (Berkenhout, 1769)) Tanpa dan Dengan Tumor Payudara Setelah Perlakuan Terapi Medan Listrik AC Frekuensi Menengah

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Efektivitas metode pengobatan kanker seperti pembedahan, radioterapi, krioterapi, kemoterapi, terapi hormon, dan imunoterapi masih terkendala oleh efek samping signifikan yang ditimbulkan setelah pengobatan. Hal tersebut menunjukkan urgensi pencarian metode pengobatan kanker minim efek samping, salah satunya melalui pengembangan penggunaan medan listrik statis frekuensi menengah melalui alat *Electro- Capacitive Cancer Therapy* (ECCT). Terapi ECCT telah terbukti dapat menghambat pertumbuhan tumor dan mempengaruhi ekspresi sitokin dan kemokin pada jaringan tumor payudara tikus tanpa mempengaruhi kondisi jaringan payudara normal. Walaupun begitu, pengaruh terapi ECCT pada jaringan organ vital non target belum diteliti lebih lanjut, salah satunya pada jaringan paru-paru. Hal tersebut menjadi penting mengingat setiap jaringan memiliki karakteristik yang berbeda-beda termasuk dalam hal tingkat ekspresi sitokin dan kemokin. Oleh karena itu, penelitian dilakukan untuk mempelajari ekspresi relatif mRNA *CCL2*, *CCR2* dan *IL10* jaringan paru-paru tikus tanpa dan dengan tumor payudara terhadap pemaparan terapi ECCT yang dianalisis berdasarkan perbedaan nilai *quantification cycle* (*cq*) dari proses qRT-PCR mRNA gen target. Data *cq* yang diperoleh dihitung dengan rumus Livak untuk menentukan nilai relatif ekspresi mRNA gen-gen yang dikaji. Nilai tersebut kemudian dianalisis secara statistik dengan ANOVA Dua Arah untuk melihat tingkat signifikasinya. Hasil penelitian menyatakan tidak terjadi perubahan ekspresi relatif mRNA *CCL2*, *CCR2* dan *IL10*. Kondisi tersebut disimpulkan bahwa paparan medan listrik statis melalui terapi ECCT pada frekuensi 150 kHz dan voltase 18 Vpp tidak berpengaruh terhadap ekspresi relatif mRNA *CCL2*, *CCR2* dan *IL10* pada jaringan paru-paru dengan atau tanpa tumor payudara.

Kata kunci : *CCL2*, *CCR2*, *IL10*, ECCT, Aktivitas Makrofag.

ABSTRACT

mRNA Relative Expression of *CCL2*, *CCR2*, and *IL10* of Albino Rat's Lung (*Rattus norvegicus* (Berkenhout, 1769)) Without and With Mammary Tumor after Exposed to Medium Frequency AC Electrical Fields

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The effectiveness of cancer treatment methods such as surgery, radiotherapy, cryotherapy, chemotherapy, hormone therapy, and immunotherapy is still constrained by the significant side effects that occur after treatment. This shows the urgency of finding cancer treatment methods with minimal side effects, one of which is through the development of the use of medium-frequency static electric fields through Electro-Capacitive Cancer Therapy (ECCT) devices. ECCT therapy has been shown to inhibit tumor growth and affect the expression of cytokines and chemokines in rat breast tumor tissue without affecting the condition of normal breast tissue. Even so, the effect of ECCT therapy on non-target vital organ tissues has not been studied further, one of which is lung tissue. This is important considering that each tissue has different characteristics, including the level of expression of cytokines and chemokines. Therefore, this study was conducted to study the relative expression of mRNA *CCL2*, *CCR2* and *IL10* in lung tissue of mice without and with breast tumors against exposure to ECCT therapy which was analyzed based on the difference in *quantification cycle (cq)* values from qRT-PCR. The obtained *cq* data was calculated using the Livak formula to determine the relative value of the mRNA expression of the genes being studied. This value was then analyzed statistically using a two-way ANOVA to see its significance level. The results showed that there was no change in the relative expression of *CCL2*, *CCR2* and *IL10* mRNA. It was concluded that exposure to static electric fields through ECCT therapy at a frequency of 150 kHz and an voltage of 18 Vpp had no effect on the relative expression of *CCL2*, *CCR2* and *IL10* mRNA in lung tissue with or without breast tumors.

Keywords : *CCL2*, *CCR2*, *ECCT*, *IL10*, macrophages activity.