

**LEVEL EKSPRESI GEN *IL2R*, *IFN* DAN *TGF- β*
PADA JARINGAN TUMOR PAYUDARA TIKUS
(*Rattus norvegicus* Berkenhout, 1769) DENGAN
PERLAKUAN PAPARAN MEDAN LISTRIK STATIS
FREKUENSI MENENGAH DAN INTENSITAS RENDAH**

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INTISARI

Metode terapi kanker berbasis medan listrik statis, *Electro-Capacitive Cancer Therapy* (ECCT) telah dikembangkan dan dikaji manfaat serta efek terhadap penghambatan pertumbuhan tumor payudara pada tikus sebagai langkah uji praklinis. Dalam menjelaskan fenomena tersebut, dilakukan pengkajian terkait pengaruh ECCT terhadap sel imun, salah satunya sel NK yang memiliki peran penting dalam lingkungan mikrotumor. Beberapa gen yang penting untuk dikaji *IL2R*, *IFN* dan *TGF- β* . Hal ini karena gen tersebut penting dalam aktivasi efek sitotoksik sel NK dan regulasi respon antitumor oleh sel NK. Tujuan penelitian ini adalah untuk mengetahui ekspresi gen *IL2R*, *IFN* dan *TGF- β* pada jaringan payudara dan tumor payudara tikus dengan perlakuan medan listrik statis frekuensi menengah (150 kHz) dan intensitas rendah (18 Vpp). Sampel yang digunakan pada penelitian ini berasal dari simpanan biobank berupa jaringan payudara dan jaringan tumor payudara tikus yang disimpan dalam RNA Later. Pada penelitian ini terdapat 4 kelompok perlakuan : Non Induksi Non Terapi (NINT), Non Induksi Terapi (NIT), Induksi Non Terapi (INT) dan Induksi Terapi (IT). Tumor pada tikus diinduksi dengan 7,12-Dimethylbenz[α]anthracene (DMBA). Dalam melakukan penelitian ini, dilakukan Isolasi RNA, sintesis cDNA dan kuantifikasi dengan qPCR. Hasil qPCR gen *IL2R*, *IFN* dan *TGF- β* dianalisis dengan dengan metode Livak untuk mengetahui level ekspresi relatif. Data dalam penelitian ini dianalisis secara statistik menggunakan T-Test. Hasil penelitian ini menunjukkan bahwa level ekspresi relatif mRNA gen *IL2R*, *IFN* dan *TGF- β* pada tikus dengan tumor payudara yang diberi perlakuan terapi medan listrik (IT) mengalami *up-regulation* jika dibandingkan dengan tikus normal dan tanpa terapi (NINT). Kesimpulan dari penelitian ini yakni perlakuan terapi pada tikus yang bertumor cenderung meningkatkan ekspresi gen *IL2R*, *IFN* dan *TGF- β* jika dibandingkan dengan yang tikus tanpa terapi, meskipun perbedaannya belum signifikan.

Kata kunci : medan listrik statis, ekspresi gen, sel NK, *IL2R*, *IFN*, *TGF- β*

**LEVELS OF *IL2R*, *IFN* AND *TGF-β* GENES EXPRESSION IN
RAT (*Rattus norvegicus* Berkenhout, 1769) BREAST TUMOR TISSUE
AFTER THE EXPOSURE OF STATIC ELECTRIC FIELD
WITH INTERMEDIATE FREQUENCY AND LOW INTENSITY**

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ABSTRACT

Cancer therapy based on electric field, such as Electro-Capacitive Cancer Therapy (ECCT) has been developed and studied especially about its benefits and effects on inhibiting breast tumor growth in mice in the preclinical test. In explaining this phenomenon, researches were conducted regarding the effect of ECCT on immune cells, such as NK cells which have an important role in the microtumor environment. Several genes that are important to study the role of NK cells are *IL2R*, *IFN γ* and *TGF- β* . This is because these genes are important in the activation of the cytotoxic effects of NK cells and the regulation of antitumor responses by NK cells. The aim of this study was to determine the mRNA expression level of *IL2R*, *IFN γ* and *TGF- β* genes in rat's breast tissue and breast tumor tissue after static electric field exposure with medium frequency (150 kHz) and low intensity (18 Vpp). The samples that was used in this study came from biobank deposits in the form of rat's breast tissue and breast tumor tissue stored in RNALater. In this study there were 4 treatment groups: Non Induction Non Therapy (NINT), Non Induction Therapy (NIT), Induction Non Therapy (INT) and Induction Therapy (IT). Tumors in mice were induced with 7,12-Dimethylbenz[α]anthracene (DMBA). The method to conduct this research were RNA isolation, cDNA synthesis and quantification that were carried out by qPCR. The qPCR results of the expression of *IL2R*, *IFN γ* and *TGF- β* genes were analyzed using the Livak method to determine the relative mRNA expression levels. The data in this study were statistically analyzed using T-Test. The results of this study showed that the relative mRNA expression levels of *IL2R*, *IFN γ* and *TGF- β* genes were up-regulated in mice with breast tumors that were treated with electric field therapy (IT) compared to mice without breast tumors and without treatment (NINT). In summary, the treatment in tumorous mice tends to increase the expression of *IL2R*, *IFN γ* and *TGF- β* genes when compared to mice without therapy, although the difference is not significant.

Keywords : static electric field, gene expression, NK cells, *IL2R*, *IFN γ* , *TGF- β*