

LEVEL EKSPRESI mRNA GEN KLRK1, IL2 DAN IL10 JARINGAN
TUMOR PAYUDARA TIKUS (*Rattus norvegicus* Berkenhout, 1769)
DENGAN PERLAKUAN PAPARAN MEDAN LISTRIK STATIS

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INTISARI

Kanker payudara memiliki jumlah kasus yang tinggi terutama pada wanita. Metode terapi kanker berbasis medan listrik statis, *electro-capasitive cancer therapy* (ECCT) telah dikembangkan dan dikaji manfaat serta efek yang ditimbulkan. Sel imunokompeten, salah satunya sel NK, memiliki peran terhadap lingkungan mikro tumor. Beberapa protein penting yang terlibat dalam peran sel NK yakni NKG2D (KLRK1), IL-2 dan IL-10. Tujuan penelitian ini yakni menguji ekspresi mRNA gen KLRK1, IL2 dan IL10 pada jaringan payudara dan tumor payudara tikus (*Rattus norvegicus*) dengan perlakuan medan listrik statis frekuensi menengah, intensitas rendah. Sampel yang digunakan pada penelitian ini berasal dari simpanan *biobank* berupa jaringan payudara dan jaringan tumor payudara tikus yang disimpan dalam RNA Later. Desain penelitian terdiri dari 4 kelompok perlakuan : Non Induksi Non Terapi (NINT), Non Induksi Terapi (NIT), Induksi Non Terapi (INT) dan Induksi Terapi (IT). Pada kelompok induksi tumor, tikus telah diberikan 7,12-Dimethylbenz[*a*]anthracene (DMBA) dengan dosis 20 mg/kg secara gastrointestinal, sementara pada kelompok terapi, tikus diberikan perlakuan terapi medan listrik kandang ECCT dengan durasi 2x5 jam/hari selama 21 hari. Sampel jaringan diisolasi total RNA menggunakan Trizol, dan selanjutnya RNA digunakan untuk sintesis cDNA. Ekspresi relatif gen KLRK1, IL2, dan IL10 dianalisis menggunakan qPCR dengan perhitungan ekspresi relatif dengan metode Livak. Data dianalisis secara statistik menggunakan t-test dan *one-way* ANOVA. Hasil analisis ekspresi relatif mRNA terhadap kelompok kontrol perlakuan (NINT) menunjukkan pada gen KLRK1 dan IL2, kelompok NIT memiliki ekspresi mRNA yang tidak berbeda signifikan ($p > 0,05$), sementara itu pada gen IL10, kelompok NIT, INT, dan IT mengalami *down-regulation* secara signifikan ($p < 0,05$) dibanding NINT. Kelompok IT memiliki ekspresi relatif *up-regulation* dibanding INT pada ketiga gen yakni IL2, dan IL10 meskipun tidak signifikan ($p > 0,05$). Kesimpulan dari penelitian ini yakni ekspresi mRNA gen IL10 mengalami *down-regulation* pada jaringan payudara tikus dengan terapi medan listrik dan tumor payudara dibandingkan jaringan payudara normal tanpa terapi. Perlakuan terapi pada tikus yang bertumor cenderung meningkatkan ekspresi relatif mRNA gen KLRK1, IL2 dan IL10 dibandingkan dengan yang tanpa terapi, meskipun belum signifikan.

Kata kunci : Tikus, tumor payudara, medan listrik, sel NK, ekspresi gen

**mRNA EXPRESSION LEVELS OF KLRK1, IL2 AND IL10 GENES IN
RAT (*Rattus norvegicus* Berkenhout, 1769) BREAST TUMOR TISSUES
WITH THE STATIC ELECTRIC FIELD EXPOSURE**

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ABSTRACT

Breast cancer has a high number of cases, especially in women. Cancer therapy method through exposure to static electric fields, electro-capacitive cancer therapy (ECCT) has been developed and its benefits and effects have been studied. NK cell as immunocompetent cells have influences to tumor microenvironment. NKG2D, IL-2, and IL-10 is some proteins associated with NK cell activity and responses to tumor development. This study aims to examine KLRK1, IL2, and IL10 gene expression in breast tissue and breast tumors in rat (*Rattus norvegicus*) with medium frequency, low intensity static electricity field treatment. Experimental design divided into 4 groups: Non-Induction Non Therapy (NINT), Non-Induction Therapy (NIT), Non-Induction Therapy (INT) and Induction Therapy (IT). Within tumor induction group, rat induced by 7,12-*Dimethylbenz[α]anthracene* (DMBA) via gastrointestinal with 20mg/kg dosage, meanwhile in therapy group rat treated with ECCT 2x5 hours/day in 21 days duration. Normal rat breast and tumors tissue were collected surgically and fixed in RNAlater solution for further RNA isolation and cDNA synthesis. Relative expression of NK cell-related genes: KLRK1, IL2, and IL10 were analyzed using qPCR by calculating the relative expression with the Livak method. Data were analyzed statistically using one-way ANOVA. The results of the relative expression analysis compared to NINT, in KLRK1 and IL2 gene the NIT group had insignificant ($p < 0,05$) change, meanwhile IL10 gene had significantly downregulated expression ($p < 0,05$) in NIT, INT, and IT compared to NINT. The IT group had a relatively upregulation than INT in the IL2, IL10, and KLRK1 genes, although it was not significant ($p > 0.05$). This study conclude that there is downregulated IL10 gene expression in normal rat breast tissue exposed to electric field therapy and breast tumor compared to normal breast tissue without therapy. Therapy treatment in rat tumor tended to increase the relative expression of KLRK1, IL2 and IL10 mRNA genes compared to those without therapy, although it was not significant.

Keywords : Rat, breast tumor, electric field, NK cell, gene expression