

**EKSPRESI PROTEIN PCNA DAN CASPASE-3  
PADA JARINGAN TUMOR TIKUS (*Rattus norvegicus* Berkenhout, 1769)  
SETELAH PEMAPARAN MEDAN LISTRIK STATIS  
FREKUENSI MENENGAH**

**INTISARI**

Kanker payudara adalah tumor ganas yang paling sering didiagnosis pada wanita dan merupakan penyebab kematian utama kedua di dunia pada wanita. Sampai saat ini, terdapat berbagai metode yang telah dikembangkan untuk menghentikan pertumbuhan tumor payudara. Namun, model pengobatan tersebut masih memiliki beberapa efek samping, sehingga menuntut dikembangkannya model pengobatan yang efektif namun memiliki resiko efek samping yang rendah. Di Indonesia saat ini sedang dikembangkan penelitian terapi tumor dengan medan listrik berfrekuensi menengah menggunakan alat yang disebut *Electro-Capacitive Cancer Therapy* (ECCT). Alat ECCT sedang dalam masa pengembangan, sehingga dibutuhkan penelitian pra-klinis menggunakan hewan model. Penelitian ini bertujuan untuk mengkaji pengaruh terapi medan listrik terhadap aktivitas proliferasi sel tumor melalui ekspresi protein PCNA dan aktivitas apoptosis sel tumor melalui ekspresi protein caspase-3 pada jaringan tikus *Rattus norvegicus* galur *Sprague Dawley* yang mengalami tumor payudara akibat diinduksi dengan *7,12-Dhimethylbenz[ $\alpha$ ]anthracene* (DMBA). Tikus percobaan dibagi menjadi 4 kelompok perlakuan, yaitu kelompok Non Induksi - Non Terapi (NINT), Non Induksi - Terapi (NIT), Induksi - Non Terapi (INT), dan Induksi - Terapi (IT). Jaringan payudara (susu) dan jaringan tumor tikus dikoleksi melalui pembedahan kemudian dibuat preparat histologis dengan metode parafin. Selanjutnya preparat histologis pada kelompok NINT dan NIT dilakukan pewarnaan hematoksilin-eosin untuk mengamati pengaruh terapi medan listrik terhadap jaringan payudara normal dan untuk mengamati karakteristik *mitotic-apoptotic figure*, sedangkan preparat histologis pada kelompok INT dan IT dilakukan pewarnaan *Immunohistochemistry* (IHC) menggunakan anti-PCNA dan anti-caspase-3 untuk mengamati aktivitas proliferasi dan apoptosis sel tumor. Dari penelitian ini didapatkan hasil bahwa terapi medan listrik statis bersifat aman atau tidak mempengaruhi jaringan payudara normal serta mampu menekan laju ekspresi PCNA hingga 16,53% dan meningkatkan laju ekspresi caspase-3 sebesar 4,75% pada jaringan tumor tikus.

**Kata kunci :** tumor payudara tikus, medan listrik, IHC, PCNA, caspase-3.

***PCNA AND CASPASE-3 PROTEIN EXPRESSION  
IN RAT TUMOR TISSUE (*Rattus norvegicus* Berkenhout, 1769)  
AFTER STATIC ELECTRIC FIELD EXPOSURE***

**ABSTRACT**

*Breast cancer is the most malignant tumor commonly diagnosed cancer in women and it's the second leading cause of women death in the world. Up to now, there are various methods that have been developed to inhibit the growth of breast cancer. However, these treatment models still have some side effects which require the development of effective therapeutic models but have a low risk of side effects. In Indonesia, research is currently being developed on moderate frequency of electric field tumor therapy using a device called Electro-Capacitive Cancer Therapy (ECCT). The ECCT equipment is under development so the pre-clinical studies are needed. This study is expected to be able to examine the effect of electric field therapy on tumor cell proliferation activity through the expression of PCNA protein and apoptotic activity of tumor cells through the expression of caspase-3 protein in the tumor tissues of *Rattus norvegicus* strain Sprague Dawley induced by 7.12 -Dhimethylbenz [ $\alpha$ ] anthracene (DMBA). The experimental rats were divided into 4 treatment groups, namely the Non Induction – Non Therapy group (NINT), the Non Induction - Therapy group (NIT), the Induction - Non Therapy group (INT), and the Induction - Therapy group (IT). The tumor tissue was collected by surgery and paraffin methods were performed to make histological preparations. Furthermore, the breast tissues (NINT and NIT groups) and breast tumor tissues were performed by Hematoxilin-Eosin staining. This staining to observe the effect of electric field therapy on normal and tumor breast tissues and to observe the characteristics of mitotic-apoptotic figure in tumor tissues. While, the INT and IT groups was performed by immunohistochemical (IHC) staining using anti-PCNA and anti-caspase-3 to observe proliferative and apoptotic activity of tumors. This study suggests that the static electric field therapy (150 kHz, 18 Vpp) is not only safe for normal breast tissues, but also has been able to suppress the rate of PCNA expression up to 16.53% and increase the caspase-3 expression rate of 4.75% on rat tumor tissues.*

**Key words :** *rat breast tumor, electric field, IHC, PCNA, caspase-3*