

INTISARI

PENGARUH KONSENTRASI BORON DAN ARAH PENYINARAN TERHADAP DOSIS DAN WAKTU TERAPI KANKER NASOFARING DENGAN *BORON NEUTRON CAPTURE THERAPY* MENGGUNAKAN PROGRAM PHITS

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INTISARI

Boron Neutron Capture Therapy (BNCT) merupakan modalitas terapi kanker yang menggunakan boron-10 yang diinjeksikan dalam pasien dan selanjutnya diiradiasi dengan neutron. Pada terapi BNCT, diperlukan waktu iradiasi yang efektif agar dosis yang diterima *Organ at Risk* (OAR) berada dibawah dosis toleransi.

Penelitian dilakukan menggunakan pendekatan probabilistik secara simulasi dengan Metode Monte Carlo. Program yang digunakan yaitu *Particle and Heavy Ion Transport code System* (PHITS) 3.30 yang dapat mensimulasikan berbagai macam partikel secara akurat dibanding program Monte Carlo lain. Pada penelitian ini dimodelkan fantom kepala dan leher dari *Oak Ridge National Laboratory* (ORNL) serta sumber neutron *Beam Shaping Assembly* (BSA). Simulasi dilakukan dengan memvariasikan arah penyinaran pada arah *Posterior-Anterior* dan *Left-Lateral* dengan konsentrasi boron sebesar 100, 110, 120, 130, dan 140 $\mu\text{g/g}$.

Hasil yang didapatkan dari penelitian ini, menunjukkan waktu iradiasi yang efektif untuk kanker nasofaring pada terapi BNCT sebesar 47,17 menit pada konsentrasi boron yang diinjeksikan ke pasien sebesar 140 $\mu\text{g/g}$ dan arah penyinaran *left-lateral*. Berdasarkan waktu iradiasi tersebut, organ sehat selama terapi masih berada di bawah dosis toleransi.

Kata kunci: Kanker Nasofaring, BNCT, Dosis, waktu iradiasi, PHITS

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**EFFECT OF BORON CONCENTRATION AND IRRADIATION
DIRECTION ON DOSAGE AND IRRADIATION TIME OF
NASOPHARYNGEAL CANCER THERAPY USING BORON NEUTRON
CAPTURE THERAPY WITH PHITS PROGRAM**

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ABSTRACT

Boron Neutron Capture Therapy (BNCT) is a cancer therapy modality that uses boron-10 which is injected into the patient and then irradiated with neutrons. In BNCT therapy, effective irradiation time is needed so that the dose received by the Organs at Risk (OAR) is below the tolerated dose.

The research was conducted using a probabilistic approach by means of simulation with the Monte Carlo method. The program used is the Particle and Heavy Ion Transport code System (PHITS) 3.30 which can accurately simulate various kinds of particles compared to other Monte Carlo programs. In this research, the head and neck phantom from Oak Ridge National Laboratory (ORNL) and Beam Shaping Assembly (BSA) neutron sources were modeled. The simulation was carried out by varying the irradiation direction in the Posterior-Anterior and Left-Lateral directions with boron concentrations of 100, 110, 120, 130, and 140 $\mu\text{g/g}$.

The results obtained from this study showed that the effective irradiation time for nasopharyngeal cancer in BNCT therapy was 47.17 minutes at a boron concentration injected into the patient of 140 $\mu\text{g/g}$ and the left-lateral irradiation direction. Based on the irradiation time, healthy organs during therapy are still below the tolerated dose.

Keywords: *Nasopharyngeal Cancer, BNCT, dose, irradiation time, PHITS*

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