ABSTRAK

Kanker prostat merupakan salah satu jenis kanker yang dapat diobati dengan teknik *brachytherapy*. *Brachytherapy* merupakan sebuah terapi kanker dengan cara penanaman inti radioaktif melalui radiasi elektromagnetik dari material radioaktif yang ditempatkan di dekat tumor atau kanker. Teknik *brachytherapy* prostat hanya dapat dilakukan pada kanker stadium awal. Banyaknya implan dari sumber radioaktif Palladium-103 yang ditanam perlu diketahui jumlah optimal untuk memastikan tingkat keamanan sebelum melakukan terapi. Penelitian ini bertujuan untuk mengetahui nilai dosis serap radiasi pada organ yang terkena sel kanker dan *organ at risk* serta untuk mengetahui berapa jumlah sumber radiasi yang harus ditanam selama terapi berlangsung yang menghasilkan nilai dosis optimal. Tahapan yang dilakukan dalam penelitian meliputi pemodelan sumber radiasi dan *phantom* inhomogen daerah sekitar kanker, *running* program dan pengolahan data hasil *running*. Nilai dosis serap radiasi berdasarkan interaksi foton pada organ dapat diperoleh menggunakan *code tally* *f8 dalam *input user code* MCNPX. Berdasarkan hasil penelitian, nilai dosis serap yang diterima setiap organ berhasil diperoleh. Jumlah implan optimal yang memberikan nilai dosis serap optimum sesuai referensi yaitu sebesar 124,14 Gray. Jumlah *seed* untuk mencapai dosis tersebut adalah 101 *seed*. Selain itu, variasi sumber radiasi Palladium-103 yang diimplankan memberikan pengaruh yang signifikan terhadap kenaikan dosis serap yang diterima setiap organ. Sumber Palladiium-103 yang divariasikan masing-masing sebanyak 10, 11, 12, 13, 14, 15, 16 sumber. Semakin banyak jumlah sumber radiasi yang diimplankan maka nilai dosis serap yang diterima setiap organ juga semakin besar.

Kata kunci: dosis serapan, *brachytherapy* prostat, Palladium-103, MCNPX

ABSTRACT

Prostate cancer is one type of cancer that can be treated with Brachytherapy Technique. Brachytherapy is a cancer therapy by implanting radioactive nuclei through electromagnetic radiation from radioactive material placed near the tumor or cancer. Prostate brachytherapy can only be performed on early stage cancers. The optimal number of implants of Palladium-103 radioactive source needs to be known to ensure the safety level before performing the therapy. This research aims to determine the value of radiation absorbed dose in organs affected by cancer cells and organs at risk and to find out how many radiation sources should be planted during therapy that produces optimal dose values. The stages carried out in the research include modeling radiation sources and inhomogeneous phantoms around cancer, running the program and processing the running data. The value of radiation absorbed dose based on the interaction of photons on organs can be obtained using the tally code f8 in the MCNPX user code input. Based on the results of the research, the absorbed dose value received by each organ was successfully obtained. The optimal number of implants that provides the optimum absorbed dose value according to the reference is 124,14 Gray. The number of seeds to achieve this dose is 101 seeds. In addition, the variation of the implanted Palladium-103 radiation source had a significant effect on the increase of absorbed dose received by each organ. Sources were varied as 10, 11, 12, 13, 14, 15, 16 sources, respectively. The greater the number of radiation sources implanted, the greater the absorbed dose value received by each organ.

Key words: absorbed dose, prostate brachytherapy, palladium-103, MCNPX