# SOME QUESTIONS REGARDING TREATMENT PLANNING FOR Cf-252 NEUTRON BRACHYTHERAPY

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**Introduction:** The use of Cf-252 isotope in the Lithuanian Cancer Center (LCC) was initiated in late 1987. Low specific activity (0.3-0.7μg) Cf-252 needles and flexible (1-5 μg) sources have been successfully employed for treatment of many different lesions (gynecology, head and neck, skin etc.). A high activity (0.3-1.5mg) remote afterloaded source has been mainly used for treatment of advanced gynecological and rectum cancers.

**Material and methods:** Treatment planning for interstitial brachytherapy with Cf-252 sources. Two types of interstitial sources are available from the vendor (Russia). Technical characteristics of these sources are presented elsewhere. Calculation of gamma and neutron absorbed dose distribution in tissue around needle and seed of flexible assembly were performed by Vtiurin at al. using Monte Carlo simulation. For the last two decades a number of investigators focused their effort on identifying RBE of Cf-252 for different cell cultures and tissues. Riabuchin at al.[11] have collected a considerable amount of the radiobiological data, plotted it against combined dose rate of gamma and neutron components and fit this data with following equation.

$Lg\eta = -0.156 \times LgP_{n+\gamma} + 0.952$ (1). Reference (prescribed) dose then is calculated in terms of isoeffective dose which is: $D_{iso} = D_{n+\gamma} \times \eta$ (2).

The Paris system has been chosen for Cf-252 interstitial brachytherapy chiefly because this system, even though primarily developed for iridium wire, is more suitable then the Manchester system. **Treatment planning for HDR remote afterloading Cf-252 brachytherapy** This eqiupment has been in use in Lithuanian Cancer Center since late 1987 and has proven to be a safe and reliable device. The unit was design to provide isodose distribution and treatment times somewhat comparable to that of conventional Ir-192 and Co-60 HDR machines. PC based „in house" computer software has been written to calculate two dimensional isodose distribution for a ANET-V insertion. The Manchester system is employed for gyneclogical treatment planning. The plane of calculation passes through the middle of the ovoids and intersects the tandem. The dose is prescribed to the point A.

**Result and conclusions:** The treatment planning techniques for interstitial and intracavitary Cf-252 brachytherapy are very similar to those for gamma emitting isotopes. Consequently, the problems are the same. We are using two dimensional dose matrix, however in order to be able comprehensivery describe and report a brachytherapy treatment, treatment planning needs to be performed in three dimensions. Otherwise, three dimensional isodose surfaces surrounding an implant can be difficult to interpret and use for a prescription which is based on physicians prior experience.

- Calibration protocol for Cf-252 sources needs to be developed
- Single uniform method for dose prescription needs to be identified