AbstractID: 13866 Title: Energy Differential Response of Cancer Cells For Low Dose Irradiation:Impact Of Monoenergetic Brachytherapy Sources

Purpose:
The purpose of this work was to evaluate the energy differential response of cancer cells under identical dose exposure to asses the relevancy of mono-energetic sources for Brachytherapy treatments.

Method and Materials:
An electron energy spectrum impinging on lived breast cancer cell lines (MDA321) was obtained by placing a 19.65 μCi $^{90}Sr/^{90}Y$ radioactive source in front of a non-uniform magnetic field constructed from two 5.08 x 5.0 cm x 2.54 cm neodimium ion permanent dipole magnets with a 1 cm separation gap. The cell lines were placed on the exit pole face of the magnet and were subsequently irradiated with different electron energies ranging from about 0.75 MeV to 1.85 MeV. The energy distribution was accurately measured with a scintillating fiber detector system that provided a 0.5% agreement with ICRU and a 5% energy resolution. The dosimetry was performed using a series of data acquired with a $^{90}Sr/^{90}Y$ 4.5 mCi SIA-6 eye applicator, 6-21 MeV fixed energies from a Varian 2100 EX linac, EBT Gafchromic and Kodak ERT2 films, and an ion chamber detector. The accuracy of the dose rate obtained at different locations along and away from the magnet inside the cell containers was within 10.7%.

Results:
The cell lines were irradiated with a 0.5-4 Gy dose range. The data indicate a very strong differential energy response for electrons around 1 MeV (more lethal) compare to those with lesser or greater energy and a survival rate of at most 10% at very low dose (0.5-2 Gy).

Conclusion:
Mono-energetic Brachytherapy sources may provide a new pathway for radio-therapy treatment optimizations following a dedicated study showing very unusual high lethality in a specific energy window for MDA321 breast cancer cells.

Conflict of Interest (only if applicable):