

Radiochromic film dosimetry in blood irradiation

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Abstract

Transfusion associated graft versus host disease (TA-GVHD) is a major problem when associated with blood transfusion. The irradiation of blood products using photon/gamma beams can limit this risk. The effect of irradiating the blood is to inhibit lymphocyte function and therefore prevent GVHD while not causing damage to platelets and other blood fractions.

Blood products are placed in a 40cm x 40cm x 31.5cm perspex 'blood box' which is filled with rice bolus, a total dose of 30.6Gy are applied using an AP and PA field. Measurements were performed by placing 1x1cm² square pieces of MD-55-2 Gafchromic/ radiochromic film perpendicular to the beam direction and within the 'active' blood volume during irradiation. An optical density of the film was recorded using a 660nm Photon Industries* spot densitometer and used to determine the absorbed dose to the blood products. A sample of 100 in-vitro blood measurement were recorded.

The results from radiochromic film have matched predicted results and absorbed dose measurements from ionization chambers at all sites within the 'active' treatment volume within $\pm 6\%$. From 100 in-vitro measurements, radiochromic film has recorded the average dose to blood products to be 30.95 ± 2.6 Gy.

Radiochromic film is a useful and accurate dosimeter in the measurement of absorbed dose for the irradiation of blood products. It serves as a dosimeter and a visible marker for irradiated blood products.