

AbstractID: 8749 Title: A Novel Small Radiotherapy Facility to Irradiate Partial Body of Zebrafish Embryos

Purpose:

To develop a new facility to irradiate partial body of zebrafish embryos and test the system with an actual radiobiology experiment.

Method and Materials:

This micro-irradiator uses a 50 kV photon beam, miniature x-ray, Xoft Inc. The source is inserted in a cylindrical brass collimator of 3 cm diameter and 3 cm long. A pinhole of 1 mm diameter along the central axis produces a well-focused pinpoint beam with a sharp penumbra. A photodiode monitors the beam and provides readings for dose calculation. Specimens are irradiated at 6 mm from the collimator and they are accurately positioned on the beam using a video camera and a computer-controlled movable table. The system was used to irradiate total and partial body of zebrafish embryos at 3 days post-fertilization to investigate radiation induced apoptosis and macrophages recruitment at 40 Gy for both irradiation modalities.

Results:

This irradiation facility is portable and can fit in any radiobiology lab. The image-guidance and high precision of the movable table enable accurate specimen position. The beam monitoring system provides exact, fast, and easy dose determination. Total body zebrafish irradiation at 40 Gy shows a severe post-treatment cell ablation effect and substantial apoptotic increase after 3 days post-irradiation. For partial body irradiation, there is an increase in apoptotic cells and remarkable macrophages recruitment after 3 days post-irradiation.

Conclusion:

This robust, simple, and effective image-guided micro-irradiator is an appropriate tool to accurately irradiate partial body of zebrafish embryos, cell cultures or any other small specimen used in radiobiology studies. The tests comparing total and partial zebrafish embryo irradiation revealed significant difference in cell response. In general, this novel micro-irradiator has expanded the radiation modalities for very small animals used in radiobiology studies and opened the possibility to adventure deeper in radiotherapy research.