Microbeam X-ray Irradiation System

Purpose:

Bystander responses are defined as responses in non-irradiated cells in the neighborhood of directly irradiated cells. These responses are one of the most important issues in estimating the risk of low-dose irradiation. However, high-doses of particle radiations have been mainly used in the study of bystander responses. Microbeam X-ray Irradiation System is installed to elucidate the mechanism of bystander responses induced by low-dose X-rays. We intend that our results will be reflected in the radiation risk models.

Outlines:

Microbeam X-ray Irradiation System is designed to exactly irradiate each targeted cell nucleus and cytoplasm with X-ray microbeam focused less than 2 μm in diameter using Fresnel zone plate (FZP). In addition, this is only one microbeam irradiation system, which enables real time imaging analysis on and after irradiation using on-line high resolution CCD camera and con-focal laser scanning microscope. Using this system, we are investigating radiation-induced bystander responses by imaging analysis.

Specifications:

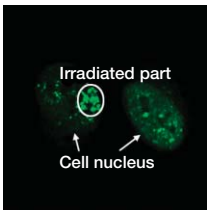
- X-ray: 1.49 keV Aluminum K-shell X-rays
- Beam size: less than 2 μm in diameter
- Beam intensity: 0.1 Gy/min - 5 Gy/min
- Focusing assembly: consists of X-ray mirror, Fresnel zone plate (FZP) and Order Selecting Aperture. Beam direction is a perpendicular upswing
- Auto stage: position plasticity is $\pm$ 0.3 μm
- CCD camera: the number of the effective pixels is 1344 (H) X 1023 (V) (ORCA-ER, Hamamatsu Photonics)
- Microscope: con-focal laser scanning microscope FV300, configured on the BX-51WI-BG (Olympus). Argon laser and Helium Neon laser are applied
- Stage chamber: cells can be cultured at 37℃, CO_2 5% on the stage

Location and Date of Installation:

Komae Campus, March 2007

Microbeam X-ray Irradiation System

X-ray microbeam irradiation device



Localization of DNA repair proteins on the irradiated part of cell nucleus