

Unique Characteristics of neutron and heavy charged particle induced DNA damage: implications for charged particle radiation therapy

Using the Atomic Force Microscopy, we have investigated X-ray, electron, neutron and Argon ion induced DNA damage. We have observed that all these radiations induce DNA double strand breaks which result in both long and short DNA fragments. However, the percentage of short DNA fragments resulting from neutron and argon-ion irradiations are significantly higher. We further investigated the biological significance of these short fragments using the DNA-PK and Ku protein binding assays; we have observed that short DNA fragments less than a certain length inhibit DNA binding of these repair proteins. We interpret observations to suggest that the greater biological effectiveness of neutron and heavy charged particles are due to their ability to generate larger fraction of such short DNA fragments.