2.5 Damage Interaction[5]

When two or more radiations are used to produce a given effect, the combined dose-effect dependence may yield information relative to intracellular damage interaction. This can be illustrated by means of Figure 2.12 where several survival curves are shown; similar considerations apply to other lethal agents and end points. If radiation X reduces survival according to A, a dose y_i of radiation Y that reduces survival to $S(y_i)$ is equivalent to dose x_i of radiation X. Irradiating with graded doses of X, each combined with dose y_i, in principle, may give a variety of results as follows. If B results such that B is the same as A replotted with the origin shifted from coordinates [0, 1] to $[x_i, S(y_i)]$, it may be concluded that the damage produced by y_i is *independent* of that due to X; that is,

$$S(y_i + x) = S(y_i) \cdot S(x) \qquad (2.33)$$

where x in Equation (2.33) is the dose from the second origin.

Definition:

Independent Action: A dose-effect dependence for radiation X, not influenced by an exposure to radiation Y.

If A′ results where A′ is superimposed on A, it may be concluded that the damage due to y_i is *additive* to that produced by X; that is,

$$S(y_i + x) = S(x_i + x) \qquad (2.34)$$

Definition:

Additive Action: A dose-effect dependence in which

[5] The terms used for interaction may not be defined in precisely the same way in different disciplines. The present definitions were developed in the context of highly quantitative dose-effect relationships at the cellular level, to afford a precise description and specification of the combined effects of two or more agents.