Indirect Radiation Therapy of Cancer by Neutrons and Synchrotron Radiation

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Indirect radiation therapy of cancer IRT inactivates tumors cells by secondary products evolving from an incorporated target upon specific absorption of external radiation (fig.1). We have developed those methods using biocompatible heavy metal complexes of Lanthanides, e.g. Gadolinium- to Lutetium-DTPA. The heavy metals are applied as key-formulations reversibly braking the blood-brain barrier (BBB), or in target-nanoparticles, i.e. magnetic target liposomes (1) and target-Ferrofluids. As external radiation we use synchrotron X-ray radiation at the K-edge of absorption and neutrons, which are completely absorbed at locally injected ^{157}Gd (Gd-NCT, black target).
The long term project is an institutional and international cooperation (Germany, Spain, France; at ESRF and ILL). During three years it shall proceed from the current animal tests and cell culture experiments to the first human applications, i.e. a novel adjuvant cancer therapy.

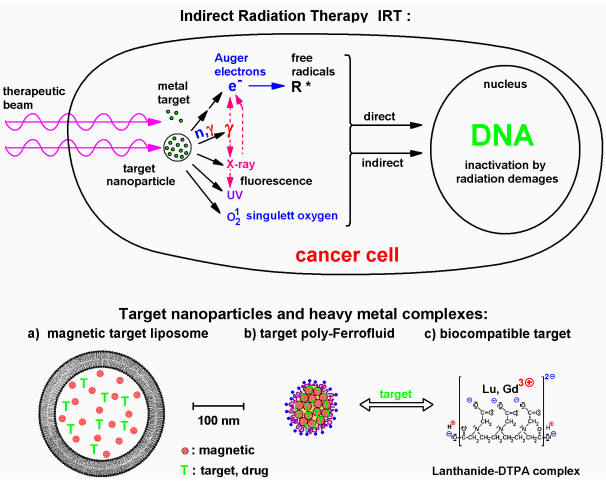

Fig. 1: Indirect radiation therapy inactivates cancer cells by secondary radiation products of short range upon specific absorption at the local target.
The target is a biocompatible DTPA-complex, which can be enriched by magnetic nanoparticles

References:
(1) T. Nawroth, M. Rusp, R.P. May; Physica B 350(2004), e635-638
(2) T. Nawroth, G. Le Duc, St. Corde, R.P. May, P. Boesecke, A. Bravin; ESRF User meeting proceedings (2006, 3 contributions)

(3) WEB: www.mpsd.de/irt