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Temporal Monitoring and Quantitative Assessment of Tumor Burden Growth Using In Vivo Bioluminescence Imaging

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In vivo bioluminescence imaging (BLI) is a sensitive imaging modality that is rapid and accessible, and may comprise an ideal tool for evaluating tumor growth. In this study, the kinetic of tumor growth has been assessed in C26 colon carcinoma bearing Balb/C mouse model. The ability of BLI to noninvasively quantitate the growth of subcutaneous tumors transplanted with C26 cells genetically engineered to stably express firefly luciferase and herpes simplex virus type-1 thymidine kinase (C26/tk-luc). A good correlation (R2 = 0.998) of photon emission to the cell number was found in vitro. Tumor burden and tumor volume were monitored in vivo over time by quantitation of photon emission using Xenogen IVIS 50 and standard external caliper measurement, respectively. At various time intervals, tumor-bearing mice were imaged to determine the correlation of in vivo BLI to tumor volume. However, a poor correlation of BLI to tumor volume was observed when tumor volume reached about 1000 mm3 (R2 = 0.907). Gamma scintigraphy combined with [131I]FIAU was another imaging modality used for verifying the previous results. In conclusion, this study showed that bioluminescence imaging is a powerful and quantitative tool for the direct assay to monitor tumor growth in vivo. The dual reporter genes transfected tumor-bearing animal model can be applied in the evaluation of the efficacy of new developed anti-cancer drugs.

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