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COMPARATIVE STUDY OF TUMOR CELL GROWTH MODELS USING BIOLUMINESCENT IMAGING IN VIVO

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Introduction. Breast cancer is a prevalent heterogeneous malignant neoplasm and the second leading cause of mortality in women, primarily due to its metastasis to distant organs [1]. Modern methods for real-time monitoring of cancer cells in mice significantly advance our understanding of the pathological mechanisms underlying disease progression. The relevance of this study lies in establishing and utilizing a breast cancer model to test promising drug candidates. A stable breast cancer model is essential for investigating tumor growth patterns and characteristics in subsequent experiments.

Main part. This study examined the growth dynamics of tumor cells injected subcutaneously in varying quantities into laboratory animals, as well as metastatic processes under different tumor cell inoculation routes in mice. The intensity and dynamics of the bioluminescent signal were analyzed relative to the injected cell volume and inoculation method. The experimental model utilized the 4T1 cell line, a highly aggressive murine breast cancer model. Two variants of this line were employed: one expressing luciferase and a non-luciferase-expressing line serving as a positive control. Female BALB/c mice were divided into seven groups of five individuals each [2], categorized by inoculation method and tumor cell quantity. Prior to transplantation, cell counts and viability assessments were conducted for each group. Three cell quantities—A, B, and C—were selected. Tumor volume measurements (for subcutaneous models) and bioluminescent signal recording (for both models) commenced one week post-inoculation using a bioluminescent analyzer [3].

Conclusions. The results revealed significant differences in tumor growth dynamics and metastatic spread between models, supported by bioluminescent signals. Over time, luminescence intensity increased but did not correlate reliably with the injected cell quantity. Two-way ANOVA analysis detected no differences between groups in the subcutaneous model. However, luminescence stability was highest in the group receiving cell quantity C.

Statistical analysis of the intravenous model demonstrated that cell quantity C differed significantly from quantities A and B ($p < 0.03$). Thus, cell quantity C proved to be the most stable option for both subcutaneous and intravenous disease models. These findings can optimize antitumor drug testing, potentially aiding the development of novel therapeutic strategies.

References:

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