

также возможна деструкция опухоли на отдельные опухолевые клетки, в которых активируются процессы гибели, и они будут эффективно удаляться клетками иммунной системы с фагоцитарной активностью. Такое развитие событий на клеточном уровне препятствует процессам воспаления, что улучшает ответ на терапию.

Таким образом, возможно достижение относительной селективной цитотоксической активности ХПС в отношении опухолевых клеток, в том числе в составе сфероидов.

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Работа не включала эксперименты с участием животных или людей.

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Авторы заявляют об отсутствии конфликтов интересов, о которых необходимо сообщить.

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Cytotoxic Activity of Atmospheric Cold Plasma Jet Towards 3D Human Breast Cancer Cell Model

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The treatment of solid tumors with a cold atmospheric plasma jet (CAP) is an innovative approach, which began to be actively developed only in the last decade. As a consequence, the studies aimed at revealing the conditions of se-

lectivity of such effects on tumor cells, including in 3D tumor models, are important. It is known that the main cytotoxic effects of CAP are caused by reactive oxygen and nitrogen species, which are formed in the plasma flow and the availability of which for the cells in the classical 2D and 3D cultivation models may be different. We used multicellular spheroids of MCF7-EGFR cells with hyperexpression of epidermal growth factor receptor (EGFR), the parental MCF7 breast adenocarcinoma cell line, and MCF10A non-transformed human breast cells. Irradiation of MCF7-EGFR spheroids led to destruction of multicellular 3D structures into individual cells with activation of death processes. It was shown that cells of CAP-irradiated spheroids underwent phagocytosis by activated macrophages. When comparing direct exposure to CAP and cultivation of MCF7-EGFR spheroids in CAP-irradiated medium (CAP-IM), a higher content of reactive oxygen and nitrogen species in spheroid cells was found when cultured in CAP-IM, which further leads to a greater cytotoxic effect than in direct irradiation. The cytotoxicity of CAP-IM has been shown to be valid longer when such medium is stored at 4 than at -20°C . Thus, it was shown that the treatment of spheroids with CAP-IM was more effective in death induction than direct CAP irradiation.

Keywords: 3D spheroids, cold plasma jet, antitumor therapy, reactive oxygen species, EGFR, breast adenocarcinoma