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Comparative Study Design Between Cell Culture Types for Therapy Application †

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Abstract: Deciphering the cellular mechanisms responsible for the appearance and evolution of different types of cancer required the development of *in vitro* experimental models that used cell culture techniques. Optimization of cell culture conditions was necessary to ensure the reproducibility of experiments. To increase the effectiveness of preclinical predictions regarding the response of tumor cells to different drug classes, 2D or 3D *in vitro* cell cultures have been used to mimic the processes occurring *in vivo* at the cellular level. The 2D cultures of cell lines are used to determine the effects of drugs on various cellular functions, such as proliferation, apoptosis, phagocytosis, mutagenesis, or cell motility. The 2D cell cultures form tight junctions in a monolayer, allowing the evaluation of protein expression involved in drug transport to the site action or the activation of signaling pathways involved in the realization of cellular functions and the response to therapy. Although 2D cell culture provides valuable *in vitro* information about how therapeutic agents act on tumor cells, these 2D cell cultures have certain limitations. One of the main limitations is the impossibility of determining how tumor cell microenvironments influence the response to therapy. In recent years, the technological progress registered in the field of biology and medicine has allowed a significant improvement in the experimental models that use cell cultures. Thus, the transition from 2D to 3D cultures allowed a rapid evolution and ensured the development of functional systems known as "organ-on-chip" that can mimic the conditions existing *in vivo*. Organ-on-chip microfluidic systems can ensure the control of the composition of tumor cells isolated from biopsies or other tumor specimens and allow visualization of the influence of tumor-associated cells such as cancer-associated fibroblasts (CAF) and immune cells, as well as how the tumor microenvironment influences the response of cells to therapy. In conclusion, the microfluidic technology on which 3D cell cultures are based allows the faster finding and characterization of new predictive markers and new targets for antitumor treatment.

Keywords: tumor therapy; cell cultures; organ-on-a-chip.

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Conflicts of Interest

The authors declare no conflict of interest.