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Development of Anticancer Silver-Incorporated PVDF Nanofibrous Scaffold

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INTRODUCTION & AIM

In this study, we present the fabrication of electrospun scaffolds consisting of polyvinylidene fluoride (PVDF) incorporated with silver nanoparticles (AgNPs).
The study aims to evaluate electrospun PVDF nanofibers' cytotoxic and anticancer properties with different concentrations of incorporated AgNPs (0.1%, 0.3%, and 0.5%). Anticancer efficacy was evaluated through *in vitro* cytotoxicity assay using MDA-MB-231 breast carcinoma and healthy MRC-5 fibroblast cell lines, yielding promising results that highlight the potential of silver-incorporated PVDF scaffolds for anticancer applications in tissue engineering.

MATERIALS AND METHODS

A 21% PVDF solution was stirred at 80 °C for 3 hours, then mixed with 0.1%, 0.3%, or 0.5% (w/w) AgNO3 and stirred for 12 hours. After homogenization, the solutions were electrospun into scaffolds.
Cytotoxicity and anticancer properties were evaluated using the MTT assay (protocol in **Figure 1**), and the data were analyzed. Visual evaluation of the samples after treatment is shown in **Figure 2**.

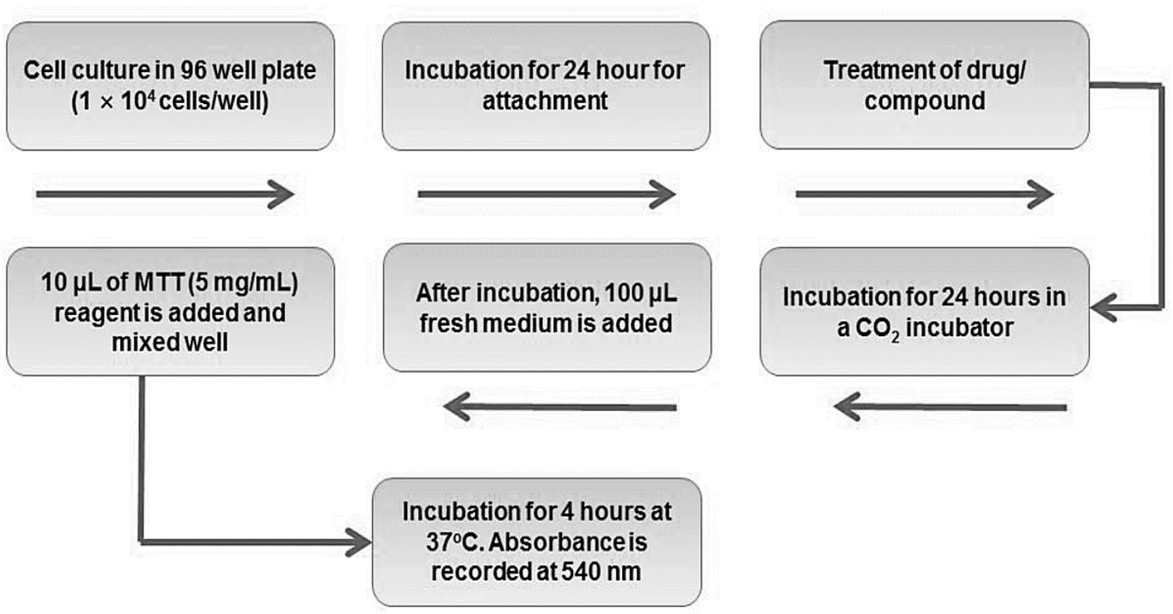

Figure 1. Schematic representation of MTT protocol

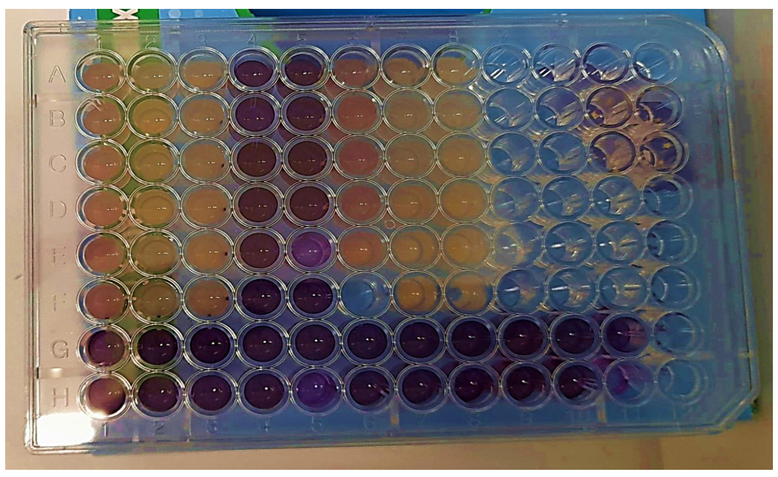

Figure 2. Evaluation of cytotoxic effects of PVDF/AgNPs by MTT assay

RESULTS & DISCUSSION

Figure 3 illustrates cell viability for MRC-5 (**A**) and MDA-MB-231 (**B**) cells after 24 h and 72 h. MRC-5 cells showed no cytotoxicity, with viability increasing over time (e.g., 97.3 ± 0.82% for pure PVDF and 77.02 ± 1.24% for PVDF/0.5% AgNPs after 72 h). In contrast, MDA-MB-231 cell viability decreased with higher AgNP content, dropping to 43.54 ± 6.64% for PVDF/0.5% AgNPs after 72 h (IC50 = 0.4%) due to Ag+ ions disrupting cancer cell metabolism.

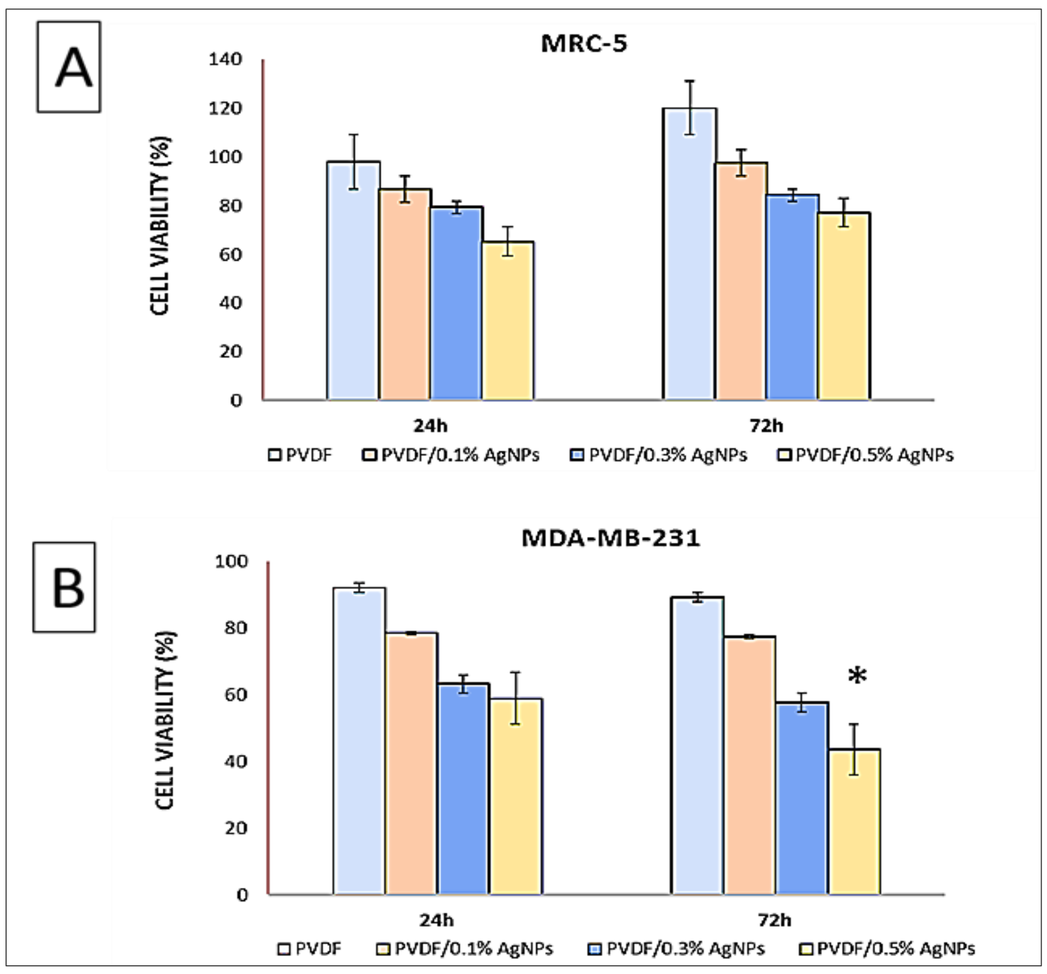

Figure 3. Cytotoxic effect against (**A**) MRC-5 and (**B**) MDA-MB-231 cell lines. * Represents statistical significance in comparison with a pure PVDF sample at $p < 0.05$

CONCLUSION

PVDF/AgNPs nanofibers showed biocompatibility with healthy MRC-5 cells but dose-dependent cytotoxicity against MDA-MB-231 cancer cells, with PVDF/0.5% AgNPs being the most effective. This highlights their potential for selective biomedical applications.

FUTURE WORK / REFERENCES

Future work will focus on integrating AgNPs into PVDF nanofibers to develop piezo properties for advanced medical systems.