

Assessment of Endocyn TM on Dental Pulp Stem Cells: A Pilot Study of Endodontic Irrigant Effects

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Introduction

Recent evidence has demonstrated that the incidence of minimally invasive dental procedures, such as vital pulp therapy, has risen in recent years. The analysis and evaluation of bioactive materials that allow for the retention and regeneration of vital dental pulp has been critical to the success of these endeavors among dental clinicians. The effectiveness of vital pulp treatment may be equally dependent upon the disinfectants, irrigants, and associated antimicrobials used prior to the placement of the pulp capping biomaterials. Recent evidence has now demonstrated that hypochlorous acid, another form of chlorine-based disinfectant, may be more effective than sodium hypochlorite in clinical applications due to the ability to penetrate microbial cell walls while limiting the effects on the human host cells. Endocyn is a recently developed, commercially available dental irrigant and disinfectant that has utilized a unique pH-neutral formulation of hypochlorous acid that remains stable over long periods of time—although research on the antimicrobial effectiveness has been limited. Furthermore, only one study to date has evaluated the effects of Endocyn on dental pulp tissue, which was limited to the evaluation of stem cells from the apical papilla, with no evaluation of the potential effects on stem cells derived from the pulp chamber.

Purpose

The purpose of this study was to determine viability and growth inhibition of DPSCs after application of EndocynTM



Methods

Using an existing biorepository of dental pulp stem cells (DPSC), Endocyn was evaluated in varying concentrations in proliferation and viability assays compared with positive (sodium hypochlorite or bleach) and negative (phosphate-buffered saline) controls in both viability and proliferation assays. DPSC viability was reduced in the range of -8.3% to -15.8%, p=0.22 to p=0.042, while growth inhibition varied between -29.7% to -63%, p=0.041 to p=0.022.

Results

These data demonstrated that all concentrations of Endocyn inhibited DPSC viability somewhat, although only high concentrations were statistically significant. In addition, all concentrations of EndocynTM inhibited DPSC growth, which is a novel and important finding not previously observed or reported that may affect clinical decision protocols and methods for the treatment of vital pulp tissue.

Conclusion

This pilot study provides some of the first comprehensive data and analysis of DPSC responses to EndocynTM, a commercial disinfectant and irrigation product used in endodontic procedures that include pulpotomy, pulpectomy, and root canals. These data revealed similar effects on DPSC growth as the positive control (sodium hypochlorite) but with less toxic effects on cellular viability - an important consideration for vital pulp treatment and therapy. These data may provide some of the first information regarding a potentially important clinical component of dental therapy that may have the potential to improve DPSC viability and survival among patients undergoing vital pulp treatments and therapies.

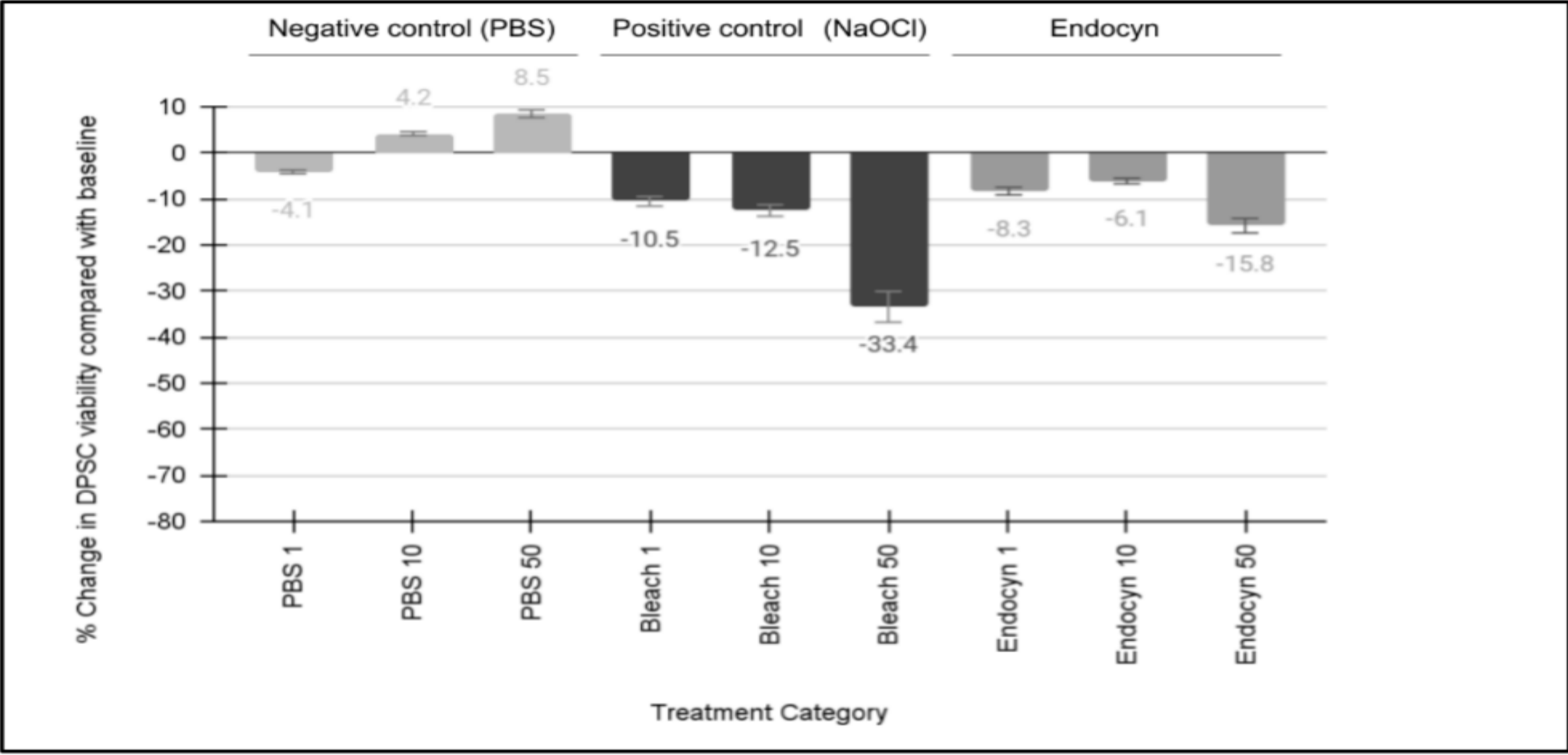


Figure 1. Effects of Endocyn on the DPSC viability. Minor changes to the DPSC viability were induced by PBS (negative control) at 1% (–4.1%), 10% (4.2%), and 50% (8.5%), $p > 0.05$. However, significant differences were observed with the NaOCl (positive control) at 1% (–10.5%), 10% (–12.5%), and 50% (–33.4%), $p < 0.05$. Endocyn induced minor changes to the viability at 1% (–8.3%) and 10% (–6.1%), $p > 0.05$, but significant reductions at the highest concentration of 50% (–15.8%), $p = 0.042$.

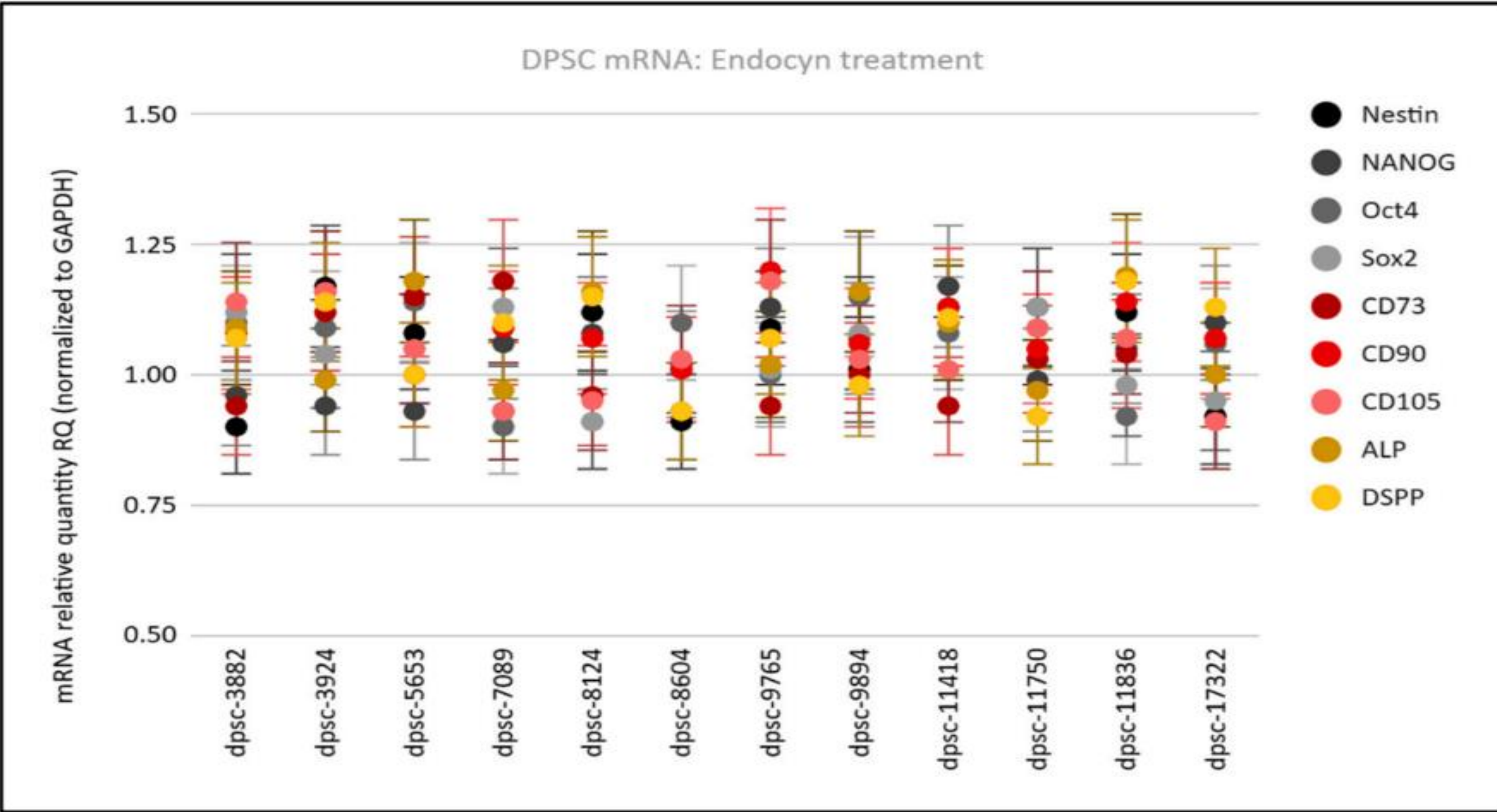


Figure 5. Analysis of the Endocyn effects on mRNA biomarker expression for the DPSC cell lines. Following the Endocyn treatment, the mRNA expression normalized to GAPDH and, compared with the baseline (untreated cells), was consistent for the MSC biomarkers Nestin (RQ: 1.04), NANOG (RQ: 1.04), Oct4 (RQ: 1.05), and Sox2 (RQ: 1.03), the ISCT biomarkers CD73 (RQ: 1.04), CD90 (RQ: 1.08), and CD105 (RQ: 1.04), and the osteogenic biomarkers DSPP (RQ: 1.05) and ALP (RQ: 1.07).

References:

Truman B, Ma L, Stewart S, Kingsley K, Sullivan V. Assessment of Endocyn on Dental Pulp Stem Cells (DPSCs): A Pilot Study of Endodontic Irrigant Effects. Methods Protoc. 2025 Feb 11;8(1):18. doi: 10.3390/mps8010018. PMID: 39997642; PMCID: PMC11858511.