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Valproic acid boosts hair follicle stem cell resilience to oxygen-glucose deprivation through autophagy induction and AKT/mTOR suppression

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GAD67–, and GFAP-positive cells and improve stroke outcomes [8]. Given that VPA promotes early neuronal differentiation in various progenitor cell types [49], it is plausible that VPA preconditioning may not only enhance HFSC survival via autophagy and AKT/mTOR modulation but also facilitate neuroglial differentiation during recovery, warranting future in vivo validation.

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Authors' Contributions Fatemeh Keshavarzi performed all experiments, statistical analyses, prepared figures, and wrote the first draft of the manuscript. Sareh Pandamooz and Mohammad Saied Salehi isolated and cultured stem cells and provided guidance on the OGD procedure. Morvarid Siri contributed to data analysis. Sanaz Dastghaib proofread and revised the initial draft. Afshin Borhani-Haghighi and Mehdi Dianatpour assisted in finalizing the manuscript. Zohreh Mostafavi-Pour co-supervised Fatemeh Keshavarzi on the migration assay and conducted the final proofreading. Pooneh Mokarram co-supervised Fatemeh Keshavarzi, designed the project, supervised the autophagy-related experiments, performed the final proofreading, and provided funding. All authors have read and approved the final version of the manuscript.

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Supplementary Information Full-length, uncropped western blot images corresponding to the main figures are provided in the Supplementary Information.

Data Availability Statement The authors declare that all data supporting the findings of this study are available within the article or are available from the corresponding author upon request.