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Artificial Intelligence in Stem Cell Research**Grace Wilson**

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Artificial intelligence (AI) is rapidly transforming stem cell research by improving the accuracy, efficiency, and reproducibility of experimental workflows. The increasing availability of high-dimensional biological datasets has created new opportunities for machine learning algorithms to identify cellular characteristics, predict differentiation pathways, and optimize regenerative therapies. This presentation explores how deep learning, computer vision, and predictive analytics are being integrated into stem cell biology. AI-powered imaging systems can automatically classify stem cell colonies, detect early signs of differentiation, and monitor cell morphology without destructive laboratory testing. Machine learning models are also capable of predicting optimal culture conditions, reducing laboratory variability while increasing production efficiency. In regenerative medicine, AI contributes to personalized treatment planning by analysing patient-specific genomic and clinical data to identify the most suitable stem cell therapies. Furthermore, computational models assist researchers in identifying biomarkers associated

with disease progression and treatment response, facilitating precision medicine approaches.

Despite these advances, challenges remain regarding data quality, algorithm transparency, regulatory compliance, and ethical implementation. Standardization of datasets and explainable AI models will be essential for widespread clinical adoption. Future developments combining artificial intelligence with robotics, automated bioreactors, and digital pathology are expected to accelerate the translation of laboratory discoveries into clinical therapies, ultimately improving patient outcomes while reducing development costs.

Biography

Grace Wilson is a computational biologist whose research combines artificial intelligence, bioinformatics, and regenerative medicine. She develops machine learning tools for stem cell analysis and has authored numerous publications on AI-driven biomedical research.