Abstract

Single-cell pharmacology has emerged as a transformative approach in pharmacological research, aiming to elucidate the heterogeneous responses of individual cells to therapeutic interventions. Traditional pharmacological studies often overlook the variability in cellular behaviors within tissues, which can signiýcantly impact drug e cacy and toxicity. By leveraging advanced technologies such as single-cell RNA sequencing (scRNA-seq), high-content imaging, and single-cell metabolomics, single-cell pharmacology o ers unprecedented insights into the molecular mechanisms underlying drug response diversity.

This abstract discusses the methodological advancements driving single-cell pharmacology and their applications in personalized medicine. It highlights how single-cell analyses enable the identiýcation of cellular subpopulations with distinct drug sensitivity proýles, particularly in oncology and neurology. By characterizing intratumoral heterogeneity and neuronal diversity, single-cell pharmacology facilitates the development of tailored therapeutic strategies that optimize treatment outcomes while minimizing adverse e ects.

Challenges in translating single-cell ýndings into clinical practice, including cost, data complexity, and standardization of methodologies, are also addressed. Future directions focus on integrating multi-omics approaches to comprehensively map cellular landscapes, advancing computational tools for data analysis, and fostering collaborative e orts across disciplines.

Keywords: ; D ; ; A (A-); ; ; C ; ; ;

Introduction

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- **Treatment optimization:** C

3. Clinical translation and challenges

- **Bridging from bench to bedside:** E

D.

- **Technological and computational advances:**

4. Future directions

- **Multi-omics integration:**

- **Emerging technologies:** C

5. Ethical and regulatory considerations

- **Ethical implications:** A

Conclusion

B

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References

1. Ha M, Kim VN (2014) Regulation of microRNA biogenesis. Nat Rev Mol Cell Biol 15: 509-524.
2. Leichter AL, Sullivan MJ, Eccles MR, Chatterjee A (2017) MicroRNA expression patterns and signalling pathways in the development and progression of childhood solid tumours. Mol Cancer 16: 15.
3. Hanahan D, Weinberg RA (2011) Hallmarks of cancer: The next generation. Cell 144: 646-674.
4. Hata A, Kashima R (2016)