

Special Issue on
Human Stem Cell-Based, Biomimetic *In Vitro* Models for Drug Research

CALL FOR PAPERS

Stem cell models are rapidly developing for use in drug research, tissue engineering, and regenerative medicine. Pharmaceutical development is a complex, lengthy, and expensive process including discovery, preclinical trials, formulation development, and clinical phases. *In vitro* models play an important role in drug discovery and development phases, being essential for drug candidate screening (pharmacokinetic profiling, assessing toxicity, and efficacy), disease modeling, and biomarker discovery. Primary cell- and cancer cell-based *in vitro* models have many limitations such as limited availability and abnormal phenotype and/or genotype. Stem cells including human pluripotent stem cells and adult stem cells are promising alternative cell sources for *in vitro* models. Recent developments, by combining advanced technologies in biomaterials science, bioengineering, nanotechnology, and tissue engineering, have made stem cell-derived *in vitro* models better mimic *in vivo* cellular and tissue conditions. The ultimate goal is to generate *in vitro* models that can be used to accurately predict pharmacokinetic and pharmacodynamics effects, to model disease development and conditions, and to identify biomarkers and potential drug targets.

For this special issue, we invite researchers from different disciplines to contribute original research and review articles on how human stem cell-based *in vitro* models can be used in drug discovery and development and how these models could be improved by better mimicking the human cellular and tissue microenvironments.

Potential topics include but are not limited to the following:

- ▶ Stem cell-based alternative tests to replace animal toxicity and pharmacokinetic and pharmacodynamic testing and to model diseases
- ▶ Animal model advances that will advance human cell models in the future
- ▶ Differentiation of stem cells into cells/tissues that are targeted by existing or novel drugs
- ▶ Controlled differentiation for optimized *in vitro* cell culture
- ▶ Understanding cell secretome as a therapeutic
- ▶ Novel stem cell types as cell source for *in vitro* models
- ▶ Maturation of stem cells into fully differentiated cells that are useful for drug discovery
- ▶ Characterization of differentiated stem cells in terms of drug metabolizing enzymes, transporters, and cell-specific functions
- ▶ Novel stem cell-based disease models, such as using genome editing technology
- ▶ Assessing toxicity of drug candidates using stem cell-derived *in vitro* models
- ▶ Pharmacokinetic profiling using stem cell-derived *in vitro* models
- ▶ High-throughput drug screening using stem cell-derived *in vitro* models
- ▶ Potential of stem cell-derived organoids for drug testing
- ▶ Generation of stem cell-derived models by biomimetics
- ▶ Mechanistic understanding of biochemical and mechanical cues during organogenesis
- ▶ Stem cell-biomaterial interactions
- ▶ Biomarker discovery using stem cell-derived models
- ▶ Stem cell-derived *in vitro* models to discriminate adverse effects from adaptive effects
- ▶ Stem cell-derived *in vitro* models for precision medicine

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