Toxicology: Open Access
ISSN: 2476-2067

Short Communication Open Access

Using Stem Cells in Nano Toxicology has Advantages and Future Potential

Susanne Bowen*

Department of Nanomedicine, UCL College of Toxicology, London, United Kingdom

Abstract

Nanomaterials are employed extensively in a variety of industries, particularly in biomedicine and stem cell therapy. However, the potential hazards connected to the use of nanomaterials are also gradually rising. To assess the developmental toxicity of nanomaterials, effective and reliable toxicological models are essential. Developmental toxicity has a new perspective thanks to advances in stem cell research. To examine the harmful effects and hazardous mechanisms, numerous researchers have recently actively investigated the impacts of nanomaterials on diverse stem cells, including adult stem cells and embryonic stem cells (ESCs). In this review, we outlined how nanomaterials affect ESC, mesenchymal stem cell, and neural stem cell proliferation and differentiation. Additionally, we talked about the benefits of stem cells in nanotoxicology.

Keywords: Stem cells; Nanotoxin; Nanomaterials application

Introduction

With the increased use of nanomaterials recently, the growth of nanotoxicology has drawn considerable attention on a global scale. For in vitro developmental toxicity studies, stem cells are the perfect targets because of their capacity for self-renewal and differentiation. Nanotoxicology research has made extensive use of stem cell toxicology models. To assess the toxicity of nanomaterials, particularly developmental toxicity, embryonic stem cells (ESCs), mesenchymal stem cells (MSCs), neural stem cells (NSCs), and other stem cell lines have become the most popular cell types. In this review, we looked at how nanomaterials affect ESCs, MSCs, and NSCs. We also contrasted the benefits and drawbacks of using stem cells in nanotoxicology research. Finally, we discuss potential directions for the study of stem cells' function in nanotoxicology. [1].

By mixing 14C-labeled materials with tobacco, researchers were able to demonstrate this effect for a number of tobacco tastes. They discovered that more than 90% of the radioactivity applied was accounted for in the mainline smoke, sidestream smoke, or the filter. Without pyrolytic degradation, it would be predicted that the parent structure and the method of administration would determine the toxicologic potential of components entrained in the smokestream. When tobacco is smoked, flavourings that are heat labile or have high enough boiling temperatures, however, may breakdown and may rearrange or combine with other smoke elements rather than being transported intact to the smoke. The pyrolysis byproducts of processed tobaccos should therefore be taken into account in a comprehensive toxicologic assessment of cigarette tastes [2].

We have previously reported the results of a series of four 13-week smoke inhalation studies conducted in rats to evaluate the biological effects of 172 ingredients used domestically by the US tobacco industry. Here, we provide the results of four skin painting initiation/promotion bioassays carried out in SENCAR mice to assess the tumor-causing potential of smoke condensate from cigarettes made up of 150 different chemical combinations. Wynder and Hoffmann (1964) employed the mouse skin painting model to explore the tumorigenic potential of cigarette smoke condensates as well as other complex mixes including particle emissions. In the initiation/promotion skin painting test method, the SENCAR mouse has been shown to be a more sensitive model system than the B6C3F1 or Swiss (CD-1) strains. Although it is unknown whether mouse skin cancers are related to any human manifestation of the toxicity of complex combinations, the skin painting model [3, 4, 5, 6].

The emerging of Nano toxicology

In comparison to other materials, nanomaterials are small, have a large specific surface area, and have a high level of surface chemical activity. Nanomaterials are widely used in many industries, including novel building materials, improved batteries, and medical applications, thanks to the swift growth of nanotechnology (Maynard, 2007). However, it was impossible to ignore how poisonous nanomaterials might be. Nanomaterials are larger than biomolecules in size, with a range of 1 to 100 nm. A type of cell that has the capacity for self-renewal and differentiation is the stem cell. They could be separated into adult stem cells and ESCs depending on the stage of development [7, 8].

In comparison to other materials, nanomaterials are small, have a large specific surface area, and have a high level of surface chemical activity. Nanomaterials are widely used in many industries, including novel building materials, improved batteries, and medical applications, thanks to the swift growth of nanotechnology (Maynard, 2007). However, it was impossible to ignore how poisonous nanomaterials might be. Nanomaterials are larger than biomolecules in size, with a range of 1 to 100 nm. A type of cell that has the capacity for self-renewal and differentiation is the stem cell. They could be separated into adult stem cells and ESCs depending on the stage of development [9, 10].The inner cell mass cells are ESCs when a fertilised egg divides and forms a blastocyst. ESCs are capable of self-renewal and could separate into potency.

Acknowledgement

This research was supported by the Xinjiang Uygur Autonomous Region's Natural Science Foundation [2021D01C252], the State Key Laboratory of Pathogenesis, Prevention, and Treatment of High

***Corresponding author:** Susanne Bowen, Department of Nanomedicine, UCL College of Toxicology, London United Kingdom, E-mail: Susanne@gmail.com

Received: 03-Jan-2023, Manuscript No: tyoa-23-85614; **Editor assigned:** 05-Jan-2023, Pre-QC No: tyoa-23-85614 (PQ); **Reviewed:** 19-Jan-2023, QC No: tyoa-23-85614; **Revised:** 21-Jan-2023, Manuscript No: tyoa-23-85614 (R); **Published:** 30-Jan-2023, DOI: 10.4172/2476-2067.1000201

Citation: Bowen S (2023) Using Stem Cells in Nano Toxicology has Advantages and Future Potential. Toxicol Open Access 9: 201.

Incidence Diseases in Central Asia [SKL-HIDCA-2021- DX2], and the Xinjiang Medical University's Scientific Research Foundation of High-Level Talents [GC2021001]. I appreciate the guidance provided by Professor Francesco Faiola for consulting and structuring the article.

Potential Conflicts of Interest

The authors affirm that they have no known financial or interpersonal conflicts that would have appeared to have an impact on the research presented in this study.

References

1. Burdick JA, Vunjak-Novakovic G (2009) Engineered microenvironments for controlled stem cell differentiation. Tissue Eng Part A15: 205-219.
2. Engler AJ, Sen S, Sweeney HL, Discher DE (2006) Matrix elasticity directs stem cell lineage specification. Cell 126: 677-689.
3. Mao AS, Shin J-W, Mooney DJ (2016) Effects of substrate stiffness and cell-cell contact on mesenchymal stem cell differentiation. Biomaterials 98: 184-191.
4. Almalki SG, Agrawal DK (2016) Key transcription factors in the differentiation of mesenchymal stem cells. Differentiation 92: 41-51.
5. Kristensen DM, Kalisz M, Nielsen JH (2005) Cytokine signalling in embryonic stem cells. APMIS 113: 756-772.
6. Sato Y, Bando H, Di Piazza M, Gowing G (2019) Tumorigenicity assessment of cell therapy products: The need for global consensus and points to consider. Cytotherapy 21: 1095-1111.
7. Barkholt L, Flory E, Jekerle V (2013) Risk of tumorigenicity in mesenchymal stromal cell-based therapies-Bridging scientific observations and regulatory viewpoints. Cytotherapy 15: 753-759.
8. Kircher MF, Gambhir SS, Grimm J (2011) Noninvasive cell-tracking methods. Nat Rev Clin. Oncol 8: 677-688.
9. Nguyen PK, Riegler J, Wu JC (2014) Stem cell imaging: From bench to bedside. Cell Stem Cell 14: 431-444.
10. Martí M, Mulero L, Pardo C (2013) Characterization of pluripotent stem cells. Nat Protoc 8: 223-253.