ISSN: 2157-7439
Journal of
Nanomedicine & Nanotechnology

OPEN ACCESS Freely available online

Editorial

A Short Note on Immunotoxicity of Nanomaterials

Ana Cristina*

Department of Nanotechnology, University of Strasbourg, France

EDITORIAL

Immuno toxicity can be induced by NMs interacting with immunocompetent cells. NMs cause apoptosis and necrosis in immune cells, while their interactions with the immune response alter immune-specific signalling pathways, resulting in alterations in immune cell function as evaluated by surface marker expression, cytokine generation, cell differentiation, and immunological activation. The duration and dysregulation of the inflammatory response are important factors in identifying NM-induced Immunotoxicity.

As a result, reliable testing necessitates the use of relevant in vitro and in vivo models that can differentiate between normal and abnormal responses. Because of their small size, NMs can elude particle-clearing defence mechanisms, and hence many do not cause an inflammatory reaction. The enhanced aggregation that occurs when the skin comes into contact with the Immune cells that selectively identify bigger particles may be able to remove or sequester them in the biological environment. Furthermore, bacterial components adsorbed on the NMs may cause inflammation. Autoimmune reactions can be triggered by self-protein interactions with NMs and their persistence in the body [1].

The failure of scavenger phagocytes to remove apoptotic cells is another mechanism that contributes to autoimmunity. Activation of inflammasomes can occur via several mechanisms. Activation of mast cells can lead to production of histamines and other substances causing airway inflammation. One factor suspected to contribute to the recent dramatic increase in incidence of allergies, lung diseases and asthma is environmental pollution and inhalation of ultrafine particles for the safe use of NMs, it is necessary to assess immunotoxicity, which necessitates the development of appropriate in vitro tests and cellular models. Although not specifically designed to evaluate NMs, OECD chemical testing methodologies, EFSA recommendations, and industry guidance can all aid in identifying potential immune system impacts [2]. Non-clinical testing for immunotoxicity caused by human medications is restricted to unexpected immunosuppression and immunoenhancement, with allergenicity and drug-specific autoimmunity ruled out. There are several immunotoxicity tests available, both in vivo and in vitro [3].

For human risk assessment, immunotoxicity can be studied in vivo in experimental animal models. In vivo models have the advantage of allowing researchers to completely investigate NM adsorption, distribution, metabolism, and excretion, all of which are important in the immune response. Alternative in vitro testing procedures must be developed to meet the 3Rs criterion and to boost efficiency. In order to validate an in vitro approach for detecting immunotoxicity, high-quality in vivo data is required. A sufficient number of positive and negative reference chemicals, comprising both medicines Food and Chemical Toxicology, are required in this regard and chemicals are put to the test [4].

The validity of several in vitro immunotoxicity approaches for assessing NM-induced immunotoxicity is a hot topic of debate. Immunosuppression, an unspecific immune response that can be produced by a variety of events, is detected by the majority of in vitro immunotoxicity models. Some in vitro models, on the other hand, incorporate innate and adaptive immune system cells, as well as biological indicators of immune function such gene expression, protein synthesis, and proliferation. The selection of appropriate cell models for in vitro immunotoxicity assessment is critical [5]. The European Union Reference Laboratory for Alternatives to Animal Testing advocates using human cells in all in vitro test systems to maximize human relevance.

Primary human cells will have the greatest clinical utility. With the exception of bone marrow assays, peripheral blood leukocytes should be used as a source of cells because they are readily available from donors [6]. Blood is a surrogate target model for other routes of exposure and a primary target model for intravenous delivery of NMs used in medical diagnostics and therapy. The blood cell model is applicable to environmental and industrial pollutants and provides information on the entire body response to NMs. Furthermore, the complexity of human peripheral blood cells as an in vitro testing model, with multiple cell components present in a relatively intact environment, is its main strength [7].

When compared to continuous cell lines, primary cells are often more sensitive and have a qualitatively distinct reaction [8]. The considerable inter-individual variability between real blood donors

*Correspondence to: Ana Cristina, Department of Nanotechnology, University of Strasbourg, France, E-mail: Strasbourg,cristina.a@gmail.com

Received: 3-Apr-2022, Manuscript No: jnmnt-22-16130, **Editor assigned:** 5-Mar-2022, Pre QC No jnmnt-22-16130 (PQ), **Reviewed:** 11-Apr-2022, QC No: jnmnt-22-16130, **Revised:** 13-Apr-2022, Manuscript No jnmnt-22-16130 (R), **Published:** 18-Apr-2022, DOI: 10.35248/2157-7439.22.13.612.

Citation: Cristina A (2022) A Short Note on Immunotoxicity of Nanomaterials. J Nanomed Nanotech. 13: 612.

and the comparatively short life time of primary blood cells in culture are both challenges for this cell model. In addition to original cells, well-characterized and validated cell lines can be utilised to investigate NM immunotoxicity. Several research groups have recently published alternative approaches using a variety of cell lines, including the human Jurkat T-cell, human lymphoid T-cell, human acute myeloid leukaemia HL-60 cell, murine T-cell CTLL-2, and THP-1 human monocytic cell line derived from a patient with acute monocytic leukaemia [9]. Tissue slices that have been precisely sliced are likewise being used. To test for detrimental effects of substances on immune cells, an in vitro tiered approach was first developed. Evaluation of myelotoxicity should be done in the first tier. Lymphoma toxicity testing should be done in the second tier [10].

CONFLICT OF INTEREST

None

ACKNOWLEDGEMENT

None

REFERENCES

1. Farcal L, Torres Andón F, Di Cristo L, Rotoli BM, Bussolati O, et al. Comprehensive *In Vitro* Toxicity Testing of a Panel of Representative Oxide Nanomaterials: First Steps towards an Intelligent Testing Strategy. PLoS One. 2015; 10(5): 0127174.
2. Kermanizadeh A, Vranic S, Boland S, Moreau K, Baeza-Squiban A, et al. An in vitro assessment of panel of engineered nanomaterials using a human renal cell line: cytotoxicity, pro-inflammatory response, oxidative stress and genotoxicity. BMC Nephrol. 2013; 14:96.
3. Chen R, Qiao J, Bai R, Zhao Y, Chen C. Intelligent testing strategy and analytical techniques for the safety assessment of nanomaterials. Anal Bioanal Chem. 2018; 410(24):6051-6066.
4. Giannakou C, Park MV, Jong WHD, Loveren HV, Vandebriel RJ, et al. A comparison of immunotoxic effects of nanomedicinal products with regulatory immunotoxicity testing requirements. Int J Nanomedicine. 2016; 11:2935-52.
5. Chen RJ, Chen YY, Liao MY, Lee YH, Chen ZY, et al. The Current Understanding of Autophagy in Nanomaterial Toxicity and Its Implementation in Safety Assessment-Related Alternative Testing Strategies. Int J Mol Sci. 2020; 21(7):2387.
6. Dusinska M, Tulinska J, El Yamani N, Kuricova M, Liskova A, et al. Immunotoxicity, genotoxicity and epigenetic toxicity of nanomaterials: New strategies for toxicity testing?. Food Chem Toxicol. 2017; 109(Pt 1):797-811.
7. Elespuru R, Pfuhler S, Aardema MJ, Chen T, Doak SH, et al. Genotoxicity Assessment of Nanomaterials: Recommendations on Best Practices, Assays, and Methods. Toxicol Sci. 2018; 164(2):391-416.
8. Pfuhler S, Elespuru R, Aardema MJ, Doak SH, Maria Donner E, et al. Genotoxicity of nanomaterials: refining strategies and tests for hazard identification. Environ Mol Mutagen. 2013; 54(4):229-39.
9. Madannejad R, Shoaie N, Jahanpeyma F, Darvishi MH, Azimzadeh M, et al. Toxicity of carbon-based nanomaterials: Reviewing recent reports in medical and biological systems. Chem Biol Interact. 2019; 307:206-222.
10. Shatkin JA, Ong KJ. Alternative Testing Strategies for Nanomaterials: State of the Science and Considerations for Risk Analysis. Risk Anal. 2016; 36(8):1564-80.