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## Plan Overview

*A Data Management Plan created using DMPonline*

**Title:** Predicting Cytotoxicity of Metal Oxide Nanoparticles Using Isalos Analytics Platform

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### Project abstract:

A literature curated dataset containing 24 distinct metal oxide (MexOy) nanoparticles (NPs), including 15 physicochemical, structural and assay-related descriptors, was enriched with 62 atomistic computational descriptors and exploited to produce a robust and validated in silico model for prediction of NP cytotoxicity. The model can be used to predict the cytotoxicity (cell viability) of MexOy NPs based on the colorimetric lactate dehydrogenase (LDH) assay and the luminometric adenosine triphosphate (ATP) assay, both of which quantify irreversible cell membrane damage. Out of the 77 total descriptors used, 7 were identified as being significant for induction of cytotoxicity by MexOy NPs. These were NP core size, hydrodynamic size, assay type, exposure dose, the energy of the MexOy conduction band (EC), the coordination number of the metal atoms on the NP surface (Avg. C.N. Me atoms surface) and the average force vector surface normal component of all metal atoms ( $v_{\perp}$  Me atoms surface). The significance and effect of these descriptors is discussed to demonstrate their direct correlation with cytotoxicity. The produced model has been made publicly available by the Horizon 2020 (H2020) NanoSolveIT project and will be added to the project's Integrated Approach to Testing and Assessment (IATA).

[Source: <https://doi.org/10.3390/nano10102017>]

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**Copyright information:**

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# Predicting Cytotoxicity of Metal Oxide Nanoparticles Using Isalos Analytics Platform

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## 1. Data summary

Provide a summary of the data addressing the following issues:

- **State the purpose of the data collection/generation**
  - **Explain the relation to the objectives of the project**
  - **Specify the types and formats of data generated/collected**
  - **Specify if existing data is being re-used (if any)**
  - **Specify the origin of the data**
  - **State the expected size of the data (if known)**
  - **Outline the data utility: to whom will it be useful**
- 
- The dataset resemble an RDF version of a published literature curated dataset containing 24 distinct metal oxide (MexOy) nanoparticles (NPs), including 15 physicochemical, structural and assay-related descriptors, enriched with 62 atomistic computational descriptors and exploited to produce a robust and validated in silico model for prediction of NP cytotoxicity.
  - As part of NanoSolveIT project WP1, we aim to provide a knowledge base for nanosafety related data by integrating existing datasets using semantic web technologies and semantic modeling. This dataset will be integrated into the under developing knowledgebase.
  - The dataset will be provided as an RDF model produced and stored in (.nq) format (N-Quads).
  - The existing data will be reused for several purposes like toxicity prediction, nano-QSAR and NanoInChI calculations.
  - The original data, from which the RDF version is derived, is provided as a supplementary material of a peer-reviewed article with the DOI: <https://doi.org/10.3390/nano10102017>
  - The dataset is ~4 MB in total, fairly small and easy to store and transfer.
  - The dataset will be useful to researchers in the nanosafety domain

## 2. FAIR data

### 2.1 Making data findable, including provisions for metadata:

- **Outline the discoverability of data (metadata provision)**
  - **Outline the identifiability of data and refer to standard identification mechanism. Do you make use of persistent and unique identifiers such as Digital Object Identifiers?**
  - **Outline naming conventions used**
  - **Outline the approach towards search keyword**
  - **Outline the approach for clear versioning**
  - **Specify standards for metadata creation (if any). If there are no standards in your discipline describe what metadata will be created and how**
- 
- The data is hosted on GitHub and archived through Zenodo and has a DOI:

<https://zenodo.org/record/5743788>

- For naming conventions, the data is in semantic web format and mapped to known ontologies (e.g. eNanoMapper, BAO and OBO)
- For versioning, Both GitHub semantic versioning and Zenodo versioning are adopted.
- For metadata standards, the dataset itself contains metadata in RDF format using ontologies like [Void](#). Also, the datasets is described with a web page and annotated using JSON-LD following the caLIBRAte quality criteria (as part of the [NSDRA](#) framework). The dataset description page: <https://nanocommons.github.io/datasets/overview/5743788.html>

## 2.2 Making data openly accessible:

- **Specify which data will be made openly available? If some data is kept closed provide rationale for doing so**
  - **Specify how the data will be made available**
  - **Specify what methods or software tools are needed to access the data? Is documentation about the software needed to access the data included? Is it possible to include the relevant software (e.g. in open source code)?**
  - **Specify where the data and associated metadata, documentation and code are deposited**
  - **Specify how access will be provided in case there are any restrictions**
- 
- The whole RDF data will be openly accessible through a SPARQL endpoint: <http://81.169.200.64:8879/sparql>
  - Both human and software can access the data since it is machine readable. The data will be directly queryable using a user interface and can be accessed programmatically using any software agent that can parse semantic format data and communicate with SPARQL query language.
  - Data Access:
    - GitHub: <https://github.com/amm257/amm257/RDFied-datasets/tree/main/02-metal-oxide-cytotoxicity/rdf>
    - Zenodo: <https://zenodo.org/record/5743788>
    - Dataset description and JSON-LD annotation: <https://nanocommons.github.io/datasets/overview/5743788.html>
    - SPARQL query interface: <http://81.169.200.64:8090/>

## 2.3 Making data interoperable:

- **Assess the interoperability of your data. Specify what data and metadata vocabularies, standards or methodologies you will follow to facilitate interoperability.**
  - **Specify whether you will be using standard vocabulary for all data types present in your data set, to allow inter-disciplinary interoperability? If not, will you provide mapping to more commonly used ontologies?**
- 
- Data/Metadata interoperability will be natively available due to adopting the semantic web approach. Using SPARQL query language, data can be queried, transformed, mapped to other formats, models and standards.
  - All datasets produced and to be integrated into the NanoSolveIT nanosafety knowledgebase will

use the same standards/ontologies.

## **2.4 Increase data re-use (through clarifying licenses):**

- **Specify how the data will be licenced to permit the widest reuse possible**
- **Specify when the data will be made available for re-use. If applicable, specify why and for what period a data embargo is needed**
- **Specify whether the data produced and/or used in the project is useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why**
- **Describe data quality assurance processes**
- **Specify the length of time for which the data will remain re-usable**

The data is licensed by [Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/)

The data is open for anyone without authentication and authorizations. It is licensed with open access license and made available with a globally unique DOI for indefinite period.

## **3. Allocation of resources**

**Explain the allocation of resources, addressing the following issues:**

- **Estimate the costs for making your data FAIR. Describe how you intend to cover these costs**
- **Clearly identify responsibilities for data management in your project**
- **Describe costs and potential value of long term preservation**

This work is part of Task 1.3 (WP1) in the NanoSolveIT project which 48 man months for Maastricht University are allocated for the whole work package.

## **4. Data security**

**Address data recovery as well as secure storage and transfer of sensitive data**

The data is openly available and so the original datasets so there is not confidential or sensitive data here.

## **5. Ethical aspects**

**To be covered in the context of the ethics review, ethics section of DoA and ethics deliverables. Include references and related technical aspects if not covered by the former**

Not applicable

## **6. Other**

**Refer to other national/funder/sectorial/departmental procedures for data management that you are using (if any)**

<https://data.europa.eu/data/datasets/open-research-data-the-uptake-of-the-pilot-in-the-first-calls-of-horizon-2020?locale=en>