# Validation of an air-liquid interface toxicological set-up using Cu, Pd and Ag well-characterized nanostructured aggregates and spheres

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# Metadata Production

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# Table of Contents

# Validation of an air-liquid interface toxicological set-up using Cu, Pd and Ag well-characterized nanostructured aggregates and spheres

***Validering av ett system för toxikologiska studier av aggregerade och sfäriska metall nanopartiklar***

## Overview

**Identification** SND0993-001

**Abstract**

Systems for studying the toxicity of metal aggregates on the airways are normally not suited for evaluating the effects of individual particle characteristics. This study validates a set-up for toxicological studies of metal aggregates using an air-liquid interface approach.

The set-up used a spark discharge generator capable of generating aerosol metal aggregate particles and sintered near spheres. The set-up also contained an exposure chamber, The Nano Aerosol Chamber for In Vitro Toxicity (NACIVT). The system facilitates on-line characterization capabilities of mass mobility, mass concentration and number size distribution to determine the exposure. By dilution, the desired exposure level was controlled.

Primary and cancerous airway cells were exposed to copper (Cu), palladium (Pd) and silver (Ag) aggregates. For Cu and Pd an exposure of sintered aerosol particles were also produced. The doses of the particles was expressed as particle numbers, masses and surface areas. For the Cu, Pd and Ag aerosol particles, a range of mass surface concentrations on the air-liquid interface of 0.4-10.7, 0.9-46.6 and 0.1-1.4 µg / cm2, respectively were achieved. Viability was measured by WST-1 assay, cytokines (Il-6, Il-8, TNF-a, MCP) by Luminex technology.

Statistically significant effects, and dose response, on cytokine expression was observed for SAEC cells after exposure to Cu, Pd or Ag particles. Also, a positive dose response was observed for SAEC viability after Cu exposure. For A549 cells, statistically significant effects on viability was observed after exposure to Cu and Pd particles.
The set-up produced a stable flow of aerosol particles with an exposure and dose expressed in terms of number, mass and surface area. Exposure related effects on the airway cellular models could be asserted.

**Kind of Data** Experimental data

**Unit of Analysis** Other

## Scope & Coverage

**Keywords** Cytokinesis, toxicity

**Time Period(s)** 2011-01-01

**Countries**

## Producers & Sponsors

**Primary Investigator(s)** Svensson, ChristianFaculty of Engineering, Lund University, Department of Design Sciences

**Other Producer(s)** Lund University

## Data Collection

**Time Period(s)** 2011-01-01
2013-01-01

## Accessibility

**Distributor(s)** Swedish National Data Service

# File Description(s)

**Dataset contains 1 file(s)**

## [[DataFileName]]

# Variable Group(s)

**Dataset contains 1 group(s)**

| Name | Label | Question |
|---|---|---|
| SND_studie | SND_study 0993 | - |
| SND_dataset | SND_dataset 001 | - |
| SND_version | SND_version 1.0 | - |
| Cu series 1 | Cu series 1 | - |
| Cu series 1 - Ndose | Cu series 1 - Ndose | - |
| Cu series 1 - mdose | Cu series 1 - mdose | - |
| Cu series 1 - Sadose | Cu series 1 - Sadose | - |
| Cu series 1 - SAEC WST-1 | Cu series 1 - SAEC WST-1 | - |
| Cu series 1 - A549 WST-1 | Cu series 1 - A549 WST-1 | - |
| Cu series 1 - Il8 | Cu series 1 - Il8 | - |
| Cu series 1 - Il6 | Cu series 1 - Il6 | - |
| Cu series 1 - MCP | Cu series 1 - MCP | - |
| Cu series 1 - TNF | Cu series 1 - TNF | - |
| Cu series 2 | Cu series 2 | - |
| Cu series 2 - Ndose | Cu series 2 - Ndose | - |
| Cu series 2 - mdose | Cu series 2 - mdose | - |
| Cu series 2 - Sadose | Cu series 2 - Sadose | - |
| Cu series 2 - SAEC WST-1 | Cu series 2 - SAEC WST-1 | - |
| Cu series 2 - A549 WST-1 | Cu series 2 - A549 WST-1 | - |
| Cu series 2 - Il8 | Cu series 2 - Il8 | - |
| Cu series 2 - Il6 | Cu series 2 - Il6 | - |
| Cu series 2 - MCP | Cu series 2 - MCP | - |
| Cu series 2 - TNF | Cu series 2 - TNF | - |
| Pd series 1 | Pd series 1 | - |
| pd series 1 - Ndose | pd series 1 - Ndose | - |
| pd series 1 - mdose | pd series 1 - mdose | - |
| pd series 1 - Sadose | pd series 1 - Sadose | - |
| pd series 1 - SAEC WST-1 | pd series 1 - SAEC WST-1 | - |

| Name | Label | Question |
|---|---|---|
| pd series 1 - A549 WST-1 | pd series 1 - A549 WST-1 | - |
| pd series 1 - Il8 | pd series 1 - Il8 | - |
| pd series 1 - Il6 | pd series 1 - Il6 | - |
| pd series 1 - MCP | pd series 1 - MCP | - |
| pd series 1 - TNF | pd series 1 - TNF | - |
| Ag series 1 | Ag series 1 | - |
| Ag series 1 - Ndose | Ag series 1 - Ndose | - |
| Ag series 1 - mdose | Ag series 1 - mdose | - |
| Ag series 1 - Il8 | Ag series 1 - Il8 | - |
| Ag series 1 - Il6 | Ag series 1 - Il6 | - |
| Ag series 1 - MCP | Ag series 1 - MCP | - |
| Ag series 1 - TNF | Ag series 1 - TNF | - |
| Ag series 2 | Ag series 2 | - |
| Ag series 2 - Ndose | Ag series 2 - Ndose | - |
| Ag series 2 - mdose | Ag series 2 - mdose | - |
| Ag series 2 - SAEC WST-1 | Ag series 2 - SAEC WST-1 | - |
| Ag series 2 - A549 WST-1 | Ag series 2 - A549 WST-1 | - |
| Ag series 2 - Il8 | Ag series 2 - Il8 | - |
| Ag series 2 - Il6 | Ag series 2 - Il6 | - |
| Ag series 2 - MCP | Ag series 2 - MCP | - |
| Ag series 2 - TNF | Ag series 2 - TNF | - |
| Material | Material | - |
| Type | Type | - |
| mobility diameter dme (nm) | mobility diameter dme (nm) | - |
| Aggregate mass (kg) | Aggregate mass (kg) | - |
| Cu aggregate primary particle diameter (nm) | Cu aggregate primary particle diameter (nm) | - |
| Pd aggregate primary particle diameter (nm) | Pd aggregate primary particle diameter (nm) | - |
| SSA Cu (m2/g) | SSA Cu (m2/g) | - |
| SSA Pd (m2/g) | SSA Pd (m2/g) | - |
| Well 6 - Area 1 (%) | - | - |
| Well 6 - Area 2 (%) | Well 6 - Area 2 (%) | - |
| Well 6 - Area 3 (%) | Well 6 - Area 3 (%) | - |

| Name | Label | Question |
|---|---|---|
| Well 6 - Area 4 (%) | Well 6 - Area 4 (%) | - |
| Well 6 - Area 5 (%) | Well 6 - Area 5 (%) | - |
| Well 18 (%) | Well 18 (%) | - |
| Well 24 (%) | Well 24 (%) | - |

# Variables Description

**Dataset contains 64 variable(s)**

## File : [[DataFileName]]

### SND_studie: SND_study 0993

**Information:** Missing: *

### SND_dataset: SND_dataset 001

**Information:** Missing: *

### SND_version: SND_version 1.0

**Information:** Missing: *

### Cu series 1: Cu series 1

**Definition:** Cu series 1 is comprised of doses Cu1 and Cu2, both aggregates generated by SDG

**Information:** Missing: *

### Cu series 1 - Ndose: Cu series 1 - Ndose

**Definition:** Number weighted dose of Cu aggregates

**Information:** Missing: *

### Cu series 1 - mdose: Cu series 1 - mdose

**Definition:** Mass weighted dose of Cu aggregates

**Information:** Missing: *

### Cu series 1 - Sadose: Cu series 1 - Sadose

**Definition:** Surface area weighted dose of Cu aggregates

**Information:** Missing: *

### Cu series 1 - SAEC WST-1: Cu series 1 - SAEC WST-1

**Definition:** WST-1 response of SAEC cultures exposed to Cu aggregates from Cu series 1

**Information:** Missing: *

### Cu series 1 - A549 WST-1: Cu series 1 - A549 WST-1

**Definition:** WST-1 response of A549 cultures exposed to Cu aggregates from Cu series 1

# File : [[DataFileName]]

## Cu series 1 - A549 WST-1: Cu series 1 - A549 WST-1

**Information:** Missing: *

## Cu series 1 - Il8: Cu series 1 - Il8

**Definition:** Il-8 expression of SAEC cultures exposed to Cu aggregates from Cu series 1

**Information:** Missing: *

## Cu series 1 - Il6: Cu series 1 - Il6

**Definition:** Il-6 expression of SAEC cultures exposed to Cu aggregates from Cu series 1

**Information:** Missing: *

## Cu series 1 - MCP: Cu series 1 - MCP

**Definition:** MCP expression of SAEC cultures exposed to Cu aggregates from Cu series 1

**Information:** Missing: *

## Cu series 1 - TNF: Cu series 1 - TNF

**Definition:** TNF-a expression of SAEC cultures exposed to Cu aggregates from Cu series 1

**Information:** Missing: *

## Cu series 2: Cu series 2

**Definition:** Cu series 2 is comprised of doses Cu3 to Cu5 of aggregates including sintered Cusint

**Information:** Missing: *

## Cu series 2 - Ndose: Cu series 2 - Ndose

**Definition:** Number weighted dose of Cu aggregates and sintered

**Information:** Missing: *

## Cu series 2 - mdose: Cu series 2 - mdose

**Definition:** Mass weighted dose of Cu aggregates and sintered

**Information:** Missing: *

## Cu series 2 - Sadose: Cu series 2 - Sadose

**Definition:** Surface area weighted dose of Cu aggregates and sintered

**Information:** Missing: *

# File : [[DataFileName]]

## Cu series 2 - Sadose: Cu series 2 - Sadose

## Cu series 2 - SAEC WST-1: Cu series 2 - SAEC WST-1

**Definition:** WST-1 response of SAEC cultures exposed to Cu from Cu series 2

**Information:** Missing: *

## Cu series 2 - A549 WST-1: Cu series 2 - A549 WST-1

**Definition:** WST-1 response of A549 cultures exposed to Cu from Cu series 2

**Information:** Missing: *

## Cu series 2 - Il8: Cu series 2 - Il8

**Definition:** Il-8 expression of SAEC cultures exposed to Cu from Cu series 2

**Information:** Missing: *

## Cu series 2 - Il6: Cu series 2 - Il6

**Definition:** Il-6 expression of SAEC cultures exposed to Cu from Cu series 2

**Information:** Missing: *

## Cu series 2 - MCP: Cu series 2 - MCP

**Definition:** MCP expression of SAEC cultures exposed to Cu from Cu series 2

**Information:** Missing: *

## Cu series 2 - TNF: Cu series 2 - TNF

**Definition:** TNF-a expression of SAEC cultures exposed to Cu from Cu series 2

**Information:** Missing: *

## Pd series 1: Pd series 1

**Definition:** Pd series 1 is comprised of doses Pd1 to Pd3 of aggregates including sintered Pdsint

**Information:** Missing: *

## pd series 1 - Ndose: pd series 1 - Ndose

**Definition:** Number weighted dose of Pd aggregates and sintered

**Information:** Missing: *

# File : [[DataFileName]]

## pd series 1 - mdose: pd series 1 - mdose

**Definition:** Mass weighted dose of Pd aggregates and sintered

**Information:** Missing: *

## pd series 1 - Sadose: pd series 1 - Sadose

**Definition:** Surface area weighted dose of Pd aggregates and sintered

**Information:** Missing: *

## pd series 1 - SAEC WST-1: pd series 1 - SAEC WST-1

**Definition:** WST-1 response of SAEC cultures exposed to Pd from Pd series 1

**Information:** Missing: *

## pd series 1 - A549 WST-1: pd series 1 - A549 WST-1

**Definition:** WST-1 response of A549 cultures exposed to Pd from Pd series 1

**Information:** Missing: *

## pd series 1 - Il8: pd series 1 - Il8

**Definition:** Il-8 expression of SAEC cultures exposed to Pd from Pd series 1

**Information:** Missing: *

## pd series 1 - Il6: pd series 1 - Il6

**Definition:** Il-6 expression of SAEC cultures exposed to Pd from Pd series 1

**Information:** Missing: *

## pd series 1 - MCP: pd series 1 - MCP

**Definition:** MCP expression of SAEC cultures exposed to Pd from Pd series 1

**Information:** Missing: *

## pd series 1 - TNF: pd series 1 - TNF

**Definition:** TNF-a expression of SAEC cultures exposed to Pd from Pd series 1

**Information:** Missing: *

## Ag series 1: Ag series 1

**Definition:** Ag series 1 is comprised of doses Ag1 to Ag3 aggregates generated by SDG

**Information:** Missing: *

# File : [[DataFileName]]

## Ag series 1: Ag series 1

## Ag series 1 - Ndose: Ag series 1 - Ndose

**Definition:** Number weighted dose of Ag aggregates

**Information:** Missing: *

## Ag series 1 - mdose: Ag series 1 - mdose

**Definition:** Mass weighted dose of Ag aggregates

**Information:** Missing: *

## Ag series 1 - Il8: Ag series 1 - Il8

**Definition:** Il-8 expression of SAEC cultures exposed to Ag aggregates from Ag series 1

**Information:** Missing: *

## Ag series 1 - Il6: Ag series 1 - Il6

**Definition:** Il-6 expression of SAEC cultures exposed to Ag aggregates from Ag series 1

**Information:** Missing: *

## Ag series 1 - MCP: Ag series 1 - MCP

**Definition:** MCP expression of SAEC cultures exposed to Ag aggregates from Ag series 1

**Information:** Missing: *

## Ag series 1 - TNF: Ag series 1 - TNF

**Definition:** TNF-a expression of SAEC cultures exposed to Ag aggregates from Ag series 1

**Information:** Missing: *

## Ag series 2: Ag series 2

**Definition:** Ag series 2 is comprised of doses Ag3 to Ag7 aggregates generated by SDG

**Information:** Missing: *

## Ag series 2 - Ndose: Ag series 2 - Ndose

**Definition:** Number weighted dose of Ag aggregates

**Information:** Missing: *

# File : [[DataFileName]]

## Ag series 2 - mdose: Ag series 2 - mdose

**Definition:** Mass weighted dose of Ag aggregates

**Information:** Missing: *

## Ag series 2 - SAEC WST-1: Ag series 2 - SAEC WST-1

**Definition:** WST-1 response of SAEC cultures exposed to Ag from Ag series 2

**Information:** Missing: *

## Ag series 2 - A549 WST-1: Ag series 2 - A549 WST-1

**Definition:** WST-1 response of A549 cultures exposed to Ag from Ag series 2

**Information:** Missing: *

## Ag series 2 - Il8: Ag series 2 - Il8

**Definition:** Il-8 expression of SAEC cultures exposed to Ag aggregates from Ag series 2

**Information:** Missing: *

## Ag series 2 - Il6: Ag series 2 - Il6

**Definition:** Il-6 expression of SAEC cultures exposed to Ag aggregates from Ag series 2

**Information:** Missing: *

## Ag series 2 - MCP: Ag series 2 - MCP

**Definition:** MCP expression of SAEC cultures exposed to Ag aggregates from Ag series 2

**Information:** Missing: *

## Ag series 2 - TNF: Ag series 2 - TNF

**Definition:** TNF-a expression of SAEC cultures exposed to Ag aggregates from Ag series 2

**Information:** Missing: *

## Material: Material

**Definition:** Electrode material of the SDG generator, either Cu or Pd for the mass mobility analysis

**Information:** Missing: *

# Variables Description

**Dataset contains 64 variable(s)**

## Type: Type

**Definition:** The morphologial type of aerosol particle

**Information:** Missing: *

## mobility diameter dme (nm): mobility diameter dme (nm)

**Definition:** The electrical mobility diameter of the aerosol particles

**Information:** Missing: *

## Aggregate mass (kg): Aggregate mass (kg)

**Definition:** The mass as determined by APM for the particle mobility diameter and material type

**Information:** Missing: *

## Cu aggregate primary particle diameter (nm): Cu aggregate primary particle diameter (nm)

**Definition:** Primary particle diameter of Cu aggregates generated by SDG, the size is determined using imageJ and TEM

**Information:** Missing: *

## Pd aggregate primary particle diameter (nm): Pd aggregate primary particle diameter (nm)

**Definition:** Primary particle diameter of Pd aggregates generated by SDG, the size is determined using imageJ and TEM

**Information:** Missing: *

## SSA Cu (m2/g): SSA Cu (m2/g)

**Definition:** The specific surface area (SSA) of Cu aggregates generated by SDG

**Information:** Missing: *

## SSA Pd (m2/g): SSA Pd (m2/g)

**Definition:** The specific surface area (SSA) of Pd aggregates generated by SDG

**Information:** Missing: *

## Well 6 - Area 1 (%)

**Information:** Missing: *

## Well 6 - Area 2 (%): Well 6 - Area 2 (%)

**Definition:** Percentage of deposited spherical Ag aerosol particles as determined by imageJ and SEM imagery, for Well 6 Area 2.

## Well 6 - Area 2 (%): Well 6 - Area 2 (%)

**Information:** Missing: *

## Well 6 - Area 3 (%): Well 6 - Area 3 (%)

**Definition:** Percentage of deposited spherical Ag aerosol particles as determined by imageJ and SEM imagery, for Well 6 Area 3.

**Information:** Missing: *

## Well 6 - Area 4 (%): Well 6 - Area 4 (%)

**Definition:** Percentage of deposited spherical Ag aerosol particles as determined by imageJ and SEM imagery, for Well 6 Area 4.

**Information:** Missing: *

## Well 6 - Area 5 (%): Well 6 - Area 5 (%)

**Definition:** Percentage of deposited spherical Ag aerosol particles as determined by imageJ and SEM imagery, for Well 6 Area 5.

**Information:** Missing: *

## Well 18 (%): Well 18 (%)

**Definition:** Percentage of deposited spherical Ag aerosol particles as determined by imageJ and SEM imagery, for Well 18

**Information:** Missing: *

## Well 24 (%): Well 24 (%)

**Definition:** Percentage of deposited spherical Ag aerosol particles as determined by imageJ and SEM imagery, for Well 24

**Information:** Missing: *