

# A common genotoxicity protocol to test Serenade nanomaterials (NMs)



## WHICH NMs ARE TESTED?

Catalytic nano **CeO<sub>2</sub>**  
used as **diesel additives**

Photocatalytic nano **TiO<sub>2</sub>**  
from **Paint**

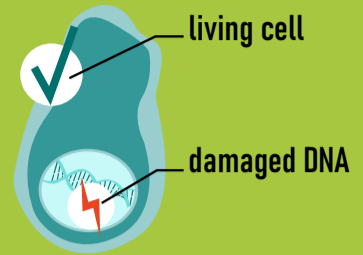
cellulose / **Ag NPs\***  
nanocomposites with biocide properties  
\*nanoparticles

**QDs** (quantum dots)  
with **indium core**

## WHAT IS GENOTOXICITY?

Genotoxicity can be an **early marker** of a carcinogenic potential, without damage cells.

Effects of a **genotoxic substance**:



## HOW TO EVALUATE GENOTOXICITY?

To analyse the genotoxic effect of a specific substance, **the tested concentrations must be lower than the lethal dose**. Thus, **cytotoxicity experiments** have to be performed beforehand. They determine the concentration for which the cell mortality appears and allow to **choose the appropriate concentration for genotoxicity tests**:



**Note!** Genotoxicity usually occurs at lower concentrations than cytotoxicity.

## OBJECTIVE

Testing the genotoxicity of different nanomaterials developed by SERENADE with a **common protocol**.

## SOME RESULTS OF THE PROJECT

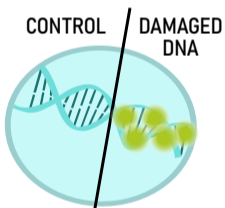
**Cytotoxicity tests** have been performed for each nanomaterial tested to determine the appropriate concentration. Genotoxicity tests have then been performed for each of them.

### Genotoxicity tests

A genotoxic substance can have different effects, it can break DNA or chromosome (composed by folded DNA and proteins) and lead to various consequences: DNA repair and micronuclei formation. Here **2 tests** have been performed to assess the genotoxicity potential of nanomaterials.

#### 53BP1 test

A genotoxic effect can cause **DNA breaking** inside the nucleus, if so the cellular machinery will repair it thanks to proteins. One of them is **53BP1**. This protein can be detected by **green fluorescent labelling**.

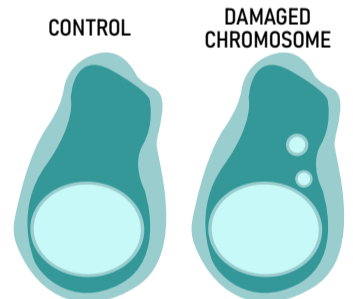


**Counting fluorescent foci** is a method to determine the quantity of 53BP1 and thus DNA repair.

If the **tested substance is genotoxic**, there will be more 53BP1 foci because of several damages to DNA. Thus, cells will be **more fluorescent than the control**.

#### Micronuclei test

When a piece of chromosome is broken or lost due to genotoxic events, it is **ejected from the nucleus** at the following cell division. This leads to the formation of **micronuclei**.



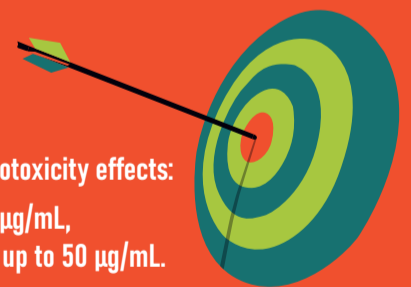
If the **tested substance is genotoxic**, the **number of micronuclei** in cells will be important compared to the control.

Nanomaterials of SERENADE with **genotoxicity effects**:

- Quantum dots are genotoxic: **from 50 nM for some pristine QDs** and **from 6 nM for all tested aged QDs**,
- cellulose AgNPs nanocomposites from 50 µg/mL**.

Nanomaterials of SERENADE **without genotoxicity effects**:

- TiO<sub>2</sub> NPs from paint up to 50 µg/mL**,
- CeO<sub>2</sub> NPs from diesel engine up to 50 µg/mL**.



## LIFE CYCLE STAGES STUDIED

