Nano-SiO_2

Nanoparticles of silica dioxide; NLRP3 inflammasome inducer

Catalog code: tlrl-sio-2

https://www.invivogen.com/nano-sio2

For research use only

Version 20A07-MM

PRODUCT INFORMATION

Contents:

- 20 mg (2 x 10 mg) Nano-SiO_2 (nanoparticles of silica dioxide)

Storage and stability:

- Nano-SiO_2 is shipped at room temperature. Upon receipt, store at room temperature (15-25°C).
- Upon resuspension, Nano-SiO_2 should be stored at 4°C. Resuspended Nano-SiO_2 is stable for 3 months when properly stored.

Quality control:

- The biological activity has been validated using cellular assays.
- The absence of bacterial contamination (e.g. lipoproteins and endotoxins) has been confirmed using HEK-Blue™ TLR2 and HEK-Blue™ TLR4 cells.

DESCRIPTION

SiO_2 nanoparticles (Nano-SiO_2) are single particles of silica dioxide, an inorganic metal oxide, with a diameter of less than 100 nm. Several studies have demonstrated that Nano-SiO_2 triggers interleukin-1β (IL-1β) secretion *in vitro* and *in vivo*[1-4]. IL-1β is produced as a pro-protein which is proteolytically processed to its active form by caspase-1. The secretion of IL-1β is an indicator of the NLRP3 inflammasome induction.

The NLRP3 inflammasome is an intracellular multi-protein complex that plays a central role in innate immunity[5, 6]. It is activated by a two-step process; a first signal ('priming') is provided by microbial molecules such as lipopolysaccharide (LPS), while the second signal is provided by a wide array of stimuli including bacterial toxins, endogenous molecules, crystals or nanoparticles such as Nano-SiO_2. This triggers inflammasome multimerization and caspase-1 activation with the subsequent maturation and secretion of IL-1β and IL-18. Research has confirmed that the IL-1β secretion and pro-inflammatory activity of Nano-SiO_2 are mediated by the NLRP3 inflammasome[1-4].

InvivoGen's Nano-SiO_2 is designed for *in vitro* assays. Its ability to induce the NLRP3 inflammasome has been validated using InvivoGen's THP1-Null cells (see Methods section).

1. Nakayama M. *et al.*, 2018. Macrophage recognition of crystals and nanoparticles. Front Immunol. 9:103. **2. He Y. *et al.*, 2016.** NEK7 is an essential mediator of NLRP3 activation downstream of potassium efflux. Nature. 530(7590):354-7. **3. Baron L. *et al.*, 2015.** The NLRP3 inflammasome is activated by nanoparticles through ATP, ADP and adenosine. Cell Death Dis. 6:e1629. **4. Yazdi AS. *et al.*, 2010.** Nanoparticles activate the NLR pyrin domain containing 3 (Nlrp3) inflammasome and cause pulmonary inflammation through release of IL-1α and IL-1β. PNAS. 107(45):19449-54. **5. Schroder K. & Tschopp J., 2010.** The inflammasomes. Cell 140(6):821-32. **6. Franchi L. *et al.*, 2012.** Sensing and reacting to microbes through the inflammasomes. Nat Immunol 13(4)325-32.

CHEMICAL PROPERTIES

CAS Number: 7631-86-9
Linear formula: SiO_2
Molecular weight: 60.08 g/mol
Solubility: Insoluble in water
Working concentrations: 10-250 µg/ml

METHODS

Resuspension of Nano-SiO_2 at 5 mg/ml (83 mM)

1. Add 2 ml of sterile water to 10 mg Nano-SiO_2 and vortex. This will provide a white suspension. Use immediately or store at 4°C.
2. Prepare further dilutions by adding the appropriate amount of sterile water or cell culture medium. Before each use, vortex to homogenize the Nano-SiO_2 suspension.

NLRP3 INFLAMMASOME INDUCTION

Nano-SiO_2 can be used to induce the NLRP3 inflammasome in cellular assays, such as InvivoGen's THP-1/HEK-Blue™ IL-1β assay. This assay uses the secretion of IL-1β by THP1-Null cells as an indicator of NLRP3 inflammasome induction. The production IL-1β by these cells is measured using HEK-Blue™ IL-1β cells. For more information about this assay please visit https://www.invivogen.com/thp1-null.

Production of IL-1β by THP1-Null cells

1. Prepare a THP1-Null cell suspension at 2 x 10^6 cells/ml and add 180 µl of this cell suspension per well of a 96-well plate (3 x 10^6 cells/well).
2. Prime THP1-Null cells with 20 µl of LPS (final concentration 1 µg/ml) for 3 hours at 37 °C in 5% CO_2.
3. Remove gently medium and add 180 µl of supplemented RPMI.
4. Add 20 µl of Nano-SiO_2 (10-250 µg/ml final concentration).
5. Incubate overnight at 37 °C in 5% CO_2.

Detection of IL-1β

Secreted IL-1β from the supernatant of the treated THP1-Null cells can be detected using InvivoGen's HEK-Blue™ IL-1β cells. For more information, visit https://www.invivogen.com/hek-blue-il1b.

RELATED PRODUCTS

Product	Description	Cat. Code
ATP	Inflammasome inducer	tlrl-atpl
CPPD Crystals	Inflammasome inducer	tlrl-cppd
HEK-Blue™ IL-1β Cells	IL-1β reporter cells	hkb-il1b
LPS-EK	LPS from *E. coli* K12	tlrl-eklps
MSU crystals	Inflammasome inducer	tlrl-msu
Nigericin	Inflammasome inducer	tlrl-nig
THP1-Null Cells	Human monocytic cells	thp-null

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