

Chronic exposure to the food additive silicon dioxide (E551) at a human-relevant dose blocks induction of oral tolerance to dietary antigens

Natália Martins Breyner, Eric Gaultier, Christel Cartier, Bruno Lamas, Eric Houdeau

▶ **To cite this version:**

Natália Martins Breyner, Eric Gaultier, Christel Cartier, Bruno Lamas, Eric Houdeau. Chronic exposure to the food additive silicon dioxide (E551) at a human-relevant dose blocks induction of oral tolerance to dietary antigens. Society of Toxicology 61 st annual meeting, Mar 2022, San Diego, United States. hal-03774862

HAL Id: hal-03774862
https://hal.inrae.fr/hal-03774862

Submitted on 12 Sep 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Print this Page for Your Records Close Window

Control/Tracking Number: 2022-A-2006-SOT
Activity: Abstract
Current Date/Time: 12/1/2021 5:12:30 AM

Chronic exposure to the food additive silicon dioxide (E551) at a human-relevant dose blocks induction of oral tolerance to dietary antigens

Author Block: N. Martins Breyner, E. Gaultier, C. Cartier, B. Lamas, and E. Houdeau. Toxalim (Research Centre in Food Toxicology), Team Enterisk, INRAE, Toulouse, France. Sponsor: *D. Zalko*

Abstract:

Food-grade SiO_2 (E551 in EU), composed of aggregated nanoparticles (NPs), is used as an anticaking and antifoaming agent in powdered foods, with chronic dietary exposure in humans (0.8-74 mg/kg/day). Because SiO_2-NP models block induction of oral tolerance (OT, an immune mechanism for food antigen acceptance), the current study in mice aimed at evaluating whether chronic exposure to E551 at a human-relevant dose, added to a solid food matrix or in liquid suspension, alters the establishment of OT towards a food antigen model.

Mice were daily treated for 60 days without (controls) or with E551 (10mg/kg BW/day) in water suspension (gastric gavage) or incorporated into food pellets (solid matrix). Food intake was controlled. At day 41, mice were orally exposed to the dietary antigen ovalbumin (OVA) (20mg/mouse; OVA-tolerized mice) or PBS vehicle for 3 days. All mice were subsequently immunized by subcutaneous injection of OVA (100µg/mouse) on day 48. Blood was collected 1 week after for anti-OVA IgG serum titers to evaluate OT induction in OVA-tolerized mice exposed or not to E551. In all groups, to further assess OT to food antigens, mice were *de novo* challenged by oral OVA (25µg/mouse) for 5 days before sacrifice. Isolated immune cells from mesenteric lymph nodes (MLN) were activated by PMA/ionomycin to assess pro- (IFNγ) and anti-inflammatory (IL-10, TGFβ) cytokine secretion measured by ELISA. Fecal lipocalin (Lcn)-2 level was used as a global marker of gut inflammation.

In control mice, OVA tolerance protocol (oral OVA) lowered by 87% circulating anti-OVA IgG levels ($p<0.0001$) compared to oral PBS group, showing normal OT induction to OVA. In contrast, anti-OVA IgG titers did not decrease in OVA-tolerized mice chronically exposed to E551 regardless of the vehicle, showing blockade of OT to food antigens. In OVA-tolerized mice exposed to E551 through food pellets, *de novo* oral challenge with OVA increased ($p<0.05$) fecal Lcn-2 levels (+131%) and IFNγ (+139%) production by MLN cells, together with a drop ($p<0.05$) of TGFβ (-46%) and IL10 (-46%) compared to OVA-tolerized controls, demonstrating gut inflammation. These results showed that chronic E551 exposure at a human dietary level in solid or liquid matrix impairs OT to dietary antigens, and promotes intestinal inflammation supporting food intolerance.

Presentation Preference (Complete): Platform or Poster
Category (Complete): Nanotoxicology, In Vivo ; Animal Models ; Food Safety/Nutrition
COI/Keywords (Complete):
The authors declare there exist no real or perceived conflict of interest : True
Keyword 1: Nanotechnology
Keyword 2: Inflammation
Keyword 3: Reference Dose
Keyword Other: : Gastrointestinal
Chemical Entity: : Silicon dioxide (SiO2)

Sponsor (Complete):
Are you or another author of the abstract an SOT member? : No
If NO, do you have a sponsor of the abstract who is a member of SOT?: Yes
Sponsor First Name : Daniel
Sponsor Last Name : Zalko
Sponsor Affiliation : National Research Institute for Agriculture, Food and Environment (INRAe)
Sponsor Email : daniel.zalko@inrae.fr

Abstract Submission Fee (Complete): Your credit card order has been processed on Wednesday 1 December 2021 at 5:09 AM.
Status: Complete

Society of Toxicology
61st Annual Meeting and ToxExpo
March 27-31, 2022

Society of Toxicology
11190 Sunrise Valley Drive, Suite 300
Reston, VA 20191
703-438-3115 Office
sothq@toxicology.org
http://www.toxicology.org/
Feedback

Powered by cOASIS, The Online Abstract Submission and Invitation System SM
© 1996 - 2021 CTI Meeting Technology All rights reserved. Privacy Policy