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Physical evolution of titanium dioxide particles in digestive fluids

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Eating titanium dioxide, an approved food color additive (E171), has raised some concerns, mainly due to its content in nanoparticles (NPs). To understand how it is handled in the gastrointestinal tract, we analyzed the behavior of food grade TiO₂ (~20% NPs, 120 nm) and P25 TiO₂ NPs (~100% NPs, 25 nm) in digestive fluids through a standardized static in vitro digestion protocol. After each step of digestion (*i.e.* saliva, gastric and intestinal step), the size of the particles and the surface charge changes were characterized using laser particle size distribution analysis and zeta potential measurements and compared to the values obtained for control digestion (without the digestion enzymes). Both food grade and P25 particles strongly agglomerate in digestive fluids due to the presence of salts and proteins. The largest agglomerates were formed in the intestinal fluid, with diameters up to several ten hundreds of micrometers. The nature of adsorbed proteins was determined by denaturing gradient gel electrophoresis (DGGE) after separation from particles. All TiO₂ samples interacted with alpha-amylase and only one sample with pepsin. Finally, E171 (~20% NPs) and P25 TiO₂ (100% NPs) do not appear to exist as nanometric entities all along the steps of the in vitro digestion protocol, which constitutes good news considering the concerns about the effects of ingested nano-products. However, these large agglomerates may be transformed in contact with the epithelium; moreover the adsorption of enzymes may have a major impact on the digestion process. Both issues are currently under investigation.

For oral presentation

For poster presentation (please tick one)