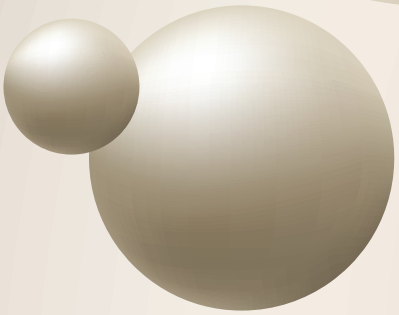
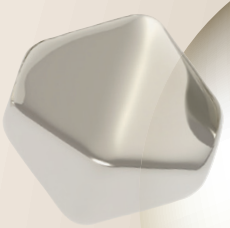
Nano in Our Food

The addition of nanoparticles to food has the potential to improve food quality, safety and nutrition. However, because of their small size, there is also the risk that ingested nanoparticles could damage cells or organs. Here we look at some of the nanoparticles used in foods and some of the potential risks. (For more on nanotech, see this month's cover story "Still Plenty of Room at the Bottom," beginning on p. 24.)

The high surface-to-volume ratio of nanoparticles can make them very reactive or catalytic





SILVER

Ag

USE: Added as antimicrobial agents in foods and food packaging material

POTENTIAL RISK: Ag nanoparticles could accumulate in the body and have toxic effects when ingested at high levels and could also promote cytotoxicity

ZINC OXIDE

ZnO

USE: Added as a source of zinc in supplements and foods, or in food packaging as antimicrobial agents or UV light absorbers

POTENTIAL RISK: ZnO nanoparticles could cause hepatic injury, kidney toxicity, lung damage and cytotoxicity

TITANIUM DIOXIDE

USE: Added in high quantities to over 900 food products as a whitening agent

POTENTIAL RISK: Affect of TiO_2 on gut microbiota could lead to inflammatory bowel diseases and colorectal cancer

TiO_2

The varying sizes, shapes and properties of nanoparticles affect their impact on the gastrointestinal tract and may alter their toxicity

ORGANIC NANOPARTICLES

USE: Being developed as delivery systems to encapsulate, protect, and release hydrophobic bioactives, like colors, flavors, antimicrobials, antioxidants, nutrients, preservatives, vitamins and minerals

POTENTIAL RISK: Organic nanoparticles could enhance bioavailability of potentially toxic substances (like pesticides or hormones) or substances that are only toxic at high levels (like some fat-soluble vitamins)

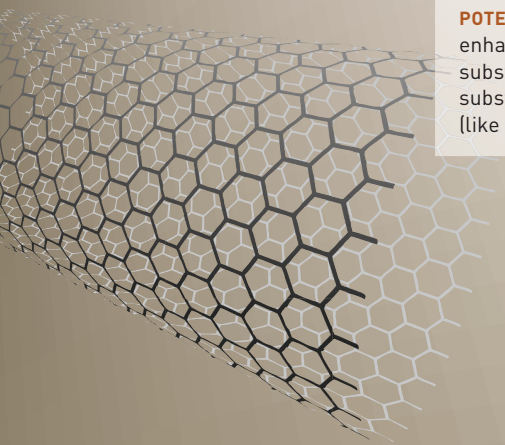
SILICON DIOXIDE

USE: Added to powdered foods as anticaking agents to enhance flow properties

POTENTIAL RISK: High levels of SiO_2 nanoparticles may cause adverse effects, such as cytotoxicity and generation of ROS. Potential adverse effect on the liver and damage cell membranes

SiO_2

Chewing one piece of gum can result in an intake of 1.5–5.1 mg of TiO_2 nanoparticles



Sources: *NPJ Science of Food*, *Frontiers in Nutrition*, NIH and Wikipedia
Nanoparticles: Getty Images / Infographic by Alessia Kirkland