Safety of TiO_2 photocatalyst

(regrading recent controversy of Silver Nano products)

Recently, the Korea Food and Drug Administration published a research result from animal tests suggesting that Silver Nano might be harmful to lung and liver. Because of this result, there may be a question regarding the safety of TiO_2 photocatalyst as it is also a nanomaterial. Thus, we would like to show that TiO_2 does not have any problem in its safety by comparing it with Silver Nano.

Silver (Ag^+) Nano	TiO_2
● Silver (Ag^+) Nano is the cationic particles with 3 to 5 nm diameter and a reactive substance that can cause chemical reactions. ● There are two anti-bacterial principles of silver cations. Silver cations adhere to bacterial wall and membrane, and disrupt the integrity of bacterial membranes, leading to bacterial death. In addition, silver cations penetrate into bacteria, and disturb the electron transport system of harmful bacteria, leading to bacterial death. ● Most of the silver ion (Ag^+) products are shipped as products that are directly ingested by humans or come into contact with skin. Therefore, the safety of chemically active silver ion products should be taken into consideration. - For example, it is argued that silver ion (Ag^+) used in toothpaste reacts with chlorine ion (Cl-) in tap water to produce silver chloride (AgCl), and thus it should be avoided for use in toothpaste. - Excessive intake of silver ion drinking water should also be cautioned. ● The Toxicity Pathology Team of the Korea Conformity Laboratories published the result showing that, - Toxicity is true, but there is no need to worry if it is not as excessive as to be occupationally exposed. - The latest result is obtained from the animal tests at very high concentrations. - Consumer exposure through household items is much lower.	● TiO_2 is a non-reactive inert substance. ● It has been proven safe by many research reports from prominent research institutes and scientists. ● Unlike silver ion (Ag^+), neutral and inert TiO_2 is a stable substance even against acids and alkalis. ● TiO_2 is also currently used in sunscreen, toothpaste, food additives (approved by FDA), and food coloring of white chocolate. ● TiO_2 photocatalyst is not active without light (i.e. it cannot generate ·OH radical). In addition, UV rays do not penetrate through the skin more than 1 mm, so even if TiO_2 is accidentally consumed in the body, the photocatalyst in the body cannot be activated. Thus it cannot be considered to cause any problem. ● ·OH radical is generated only when the light hits the surface of the photocatalyst, and moreover, its life span is only $1/10^8$ – 10^{11} seconds. Therefore, ·OH radical may only exist on the surface coated by the photocatalyst, and cannot reach human body, or the inside of the body.

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