

## SAFE BY DESIGN PRINCIPLE

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### ABSTRACT

Nanotechnology although has contributed to the development of new products with new functions, raise new safety issues. Nanoparticles of a material usually have very different qualities from those that the material has at its ordinary scale and some of these new properties may affect the quality of the environment and the human health. The concerns are rationalized due to our previous experience with health risks caused by the release into the nature of other ultrafine particles such as asbestos and air pollution with dust (PM 2.5). To avoid such incidents, the idea to analyze the safety issues in both the R&D and design phases of preparation of a new product was embedded in the concept safe-by-design (SbD). This concept targets to reduce the overall environmental and human health risks at an early phase of the innovation process, creating an integrated research strategy. In this way the functionality of a new product will be correlated with the harmfulness and safety issues generated by that product. SbD will deal with safety measures for the prevention of accidents, illnesses, or environmental damage at any stage of production of a material, from its design until its end-of-life. SbD used the doctrine of „fail early, fail often”, which means doing many safety tests *in vitro* and *in silico* to learn about issues and interactions that could decrease safety. In close relation with SbD concept is the notion of „responsibility for safety”, linked to concept of „responsible research and innovation”.

**Keywords:** safe by design, nanotechnology, safety issues, responsibility for safety

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