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NANOTOXICOLOGY OF CARBON NANOMATERIALS ACCORDING TO DIMENSIONALITY: A REVIEW

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Although nanotechnology is widely used and nanomaterials are applied in several areas of knowledge, still little is known about the real toxicological risk that can be caused by nanomaterials. A class of nanomaterials that has stood out due to their excellent physical and chemical properties and high applicability are carbon nanomaterials. Such materials exist in different dimensions, and the current classification schemes are proposed as zero (OD), one (1D), two (2D), and three-dimensional (3D). This division, based on its number of nanoscale dimensions, is due to changes in its properties according to the dimensionality. However, it is not yet known whether the toxicity level of nanomaterials can be changed according to the number of dimensions. For toxicological studies to provide broad and consistent information on the toxicity mechanisms of nanomaterials, *in vivo* experimental studies are needed in several models. Thus, this review will present a bibliographic survey of recently published scientific articles on the toxicological potential of carbon nanomaterials according to their dimensionality in the main models of *in vivo* study, especially alternative models. So, 0D materials were represented by fullerenes, one-dimensional carbon nanotubes, two-dimensional 2D graphene species and three-dimensional 3D graphene species. As a result, it was possible to observe from the various studies evaluated, in different *in vivo* models, that the toxicity of carbon nanomaterials varies according to the number of dimensions, but without necessarily presenting an increase or decrease in toxicity according to the increase in the number of dimensions up to two-dimensional materials. However, recent studies have shown that three-dimensional graphene species tend to have less toxicity than materials with a smaller number of dimensions. Finally, it was possible to note the importance of using several experimental models *in vivo*, mainly alternative models, further, to increase the understanding of toxicity mechanisms of carbon nanomaterials. Furthermore, more toxicological studies are needed involving the exposure of different model organisms to the various 3D graphene species.

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