Impact of genotoxicity data for tackling chemical safety challenges in regulation and health protection

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The safety of chemicals used in our daily lives has gained prominence on international agendas, emerging as a cornerstone priority within the EU's chemicals strategy for sustainability, aimed at contributing to a toxic-free environment. In this context, testing guidelines have been developed to warrant the safety of chemicals in market products. Among the battery of tests recommended, genotoxicity testing gains attention due to the repercussion in the development of cancer, genetic disorders, autoimmune diseases, neurodegenerative conditions, reproductive health or premature ageing.
This work aims to elucidate the application of genotoxicity testing within various risk assessment frameworks and to highlight the potential contributions of new approach methodologies (NAMs) in this field for advancing chemical safety. Additionally, it explores the complementary roles of *in vitro* and *in vivo* evidence, amplified by the application of effect biomarkers for genotoxicity in human biomonitoring in exposed populations, in shaping policies governing chemical use. The interconnection between scientific research in genotoxicity and regulatory decision-making processes is also examined.
Overall, in the realm of chemical safety, the significance of genotoxicity data is undeniable. By leveraging these data, regulators, researchers, and stakeholders can enhance regulatory decision-making, advance toxicological understanding, support evidence-based risk communication, and foster innovation in safety assessment methodologies. Embracing the multifaceted impact of genotoxicity data is essential for promoting public health, environmental sustainability, and chemical safety in the modern world.

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