

3D in vitro models of the intestine for safety testing of advanced materials

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Advanced materials are hoped to help us solve many pressing modern-day issues, e.g. regarding sustainable energy production, digitalisation and medical care. As previously experienced with manufactured nanomaterials, their increasing synthesis and potential incorporation into consumer products raises questions concerning their harmlessness.

As advanced materials can be taken up to the human body via intentional or incidental ingestion, we have developed complex in vitro testing approaches for the intestine [1,2]. We have advanced these methods to model different exposure scenarios, to test low-density materials (e.g. plastics) as well as to explore potential susceptibility differences in the healthy versus the inflamed intestine.

The models have been applied for the safety testing of various engineered nanomaterials and have been partially validated against intestinal tissue of exposed mice [1,3]. We could demonstrate pronounced material-specific effects in relation to the complexity [1,4] as well as the health status of the applied model [2]. The applicability of these models can be extended to the safety testing of advanced materials that may reach the intestine upon intentional as well as incidental oral exposures.

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1. Model complexity is a key factor for the experimental outcome.
2. Inflammatory processes can affect the models' susceptibility to exposures.

References:

- [1] Kämpfer et al. 2021, *small*, 17(15); <https://doi.org/10.1002/sml.202004223>
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- [3] Bredeck et al. 2021, *Nanomaterials*, 11(10); <https://doi.org/10.3390/nano11102621>
- [4] Llewellyn et al. 2021, *small*, 17(15); <https://doi.org/10.1002/sml.202004630>