

## Overcoming the regulatory hurdles on nanocelluloses – is bacterial cellulose absorbed at the intestine?

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### Abstract

The potential of nanomaterials in food technology is nowadays well-established. However, their commercial use requires a careful risk assessment, in particular concerning the fate of nanomaterials in the human body. Bacterial NanoCellulose (BNC), a nanofibrillar polysaccharide, has been used as a food product for many years in Asia. However, given its nano-character, several toxicological studies must be performed, according to the European Food Safety Agency's Guidance. Those should especially answer the question on whether nanoparticulate cellulose is absorbed in the Gastrointestinal Tract. This raises the need to develop a screening technique capable of detecting isolated nanosized particles in biological tissues.

Here, the potential of a Cellulose Binding Module fused to a Green Fluorescent Protein (GFP-CBM) to detect single bacterial cellulose nanocrystals (BCNC) obtained by acid hydrolysis was assessed. Adsorption studies were performed to characterize the interaction of GFP-CBM with BNC and BCNC. Correlative Electron Light Microscopy was used to demonstrate that isolated BCNC may be detected by fluorescence microscopy. The uptake of BCNC by macrophages was also assessed. Finally, an exploratory 21-day repeated dose study was performed where Wistar rats were daily fed with BNC. The presence of BNC or BCNC throughout the GIT was observed only in the intestinal lumen, suggesting that cellulose particles were not absorbed. While a more comprehensive toxicological study is necessary, these results strengthen the idea that BNC can be considered a safe food additive [1].

### References

[1] Mota, R.; Rodrigues, A.C.; Silva-Carvalho, R.; Costa, L.; Martins, D.; Sampaio, P.; Dourado, F.; Gama, M. Tracking Bacterial Nanocellulose in Animal Tissues by Fluorescence Microscopy. *Nanomaterials* 2022, *12*, 2605.