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3D printing and its perspectives in pharmaceutical science

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The evolution of three-dimensional (3D) printing has witnessed several transformative strides since its conceptualization in the 1980s. While the technology took time to gain recognition and market traction, it has matured, and today some of its variants is even capable of meeting the demands of serial production. Nowadays, the term 3D printing is getting replaced by additive manufacturing (AM) as it emphasizes its core principle better — 3D printed objects are constructed from the bottom-up, i.e. by joining solid building blocks first laterally and then in a layer-by-layer fashion, that also distinctively separate AM from traditional subtractive manufacturing. Alike many others, AM disrupts pharmaceutical research and industry, as well where ultimate product performance is imperative.

This plenary talk aims to provide an introductory lecture on AM in general and bioprinting in particular, elucidating their fundamental concepts. Despite the seemingly simplistic notion conveyed by "3D printing", AM is a nuanced technology. So, we outline the essential steps of producing a 3D-printed object, from conceptualization to the final product. The presentation will introduce the processes facilitating 3D object creation and delve into those technological variants of AM that cater pharmaceutical needs well. Last, but not least we will explore the applications of AM in pharmaceuticals and shed light on its implications for drug development, personalized therapies, and pharmacological assessments.

The second part of the talk will put bioprinting—a specialized branch of AM – into focus. We will emphasise the potential of bioprinting to construct organoids, living tissues, and even organs. The discussion will elucidate how bioprinting contributes to drug development and enhances our comprehension of pharmacokinetics, therefore paving the way for innovative pharmaceutical research and development approaches.

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