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Organ-on-a-chip: An effective time and work saver

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The restricted availability of human model systems for preclinical research and the high expenditure of time on disease target detection, drug efficacy, and toxicity is a major problem in the production of new medications. In relation to this, many technologies are emerging and organ-on-a-chip is being one of them. Organ-on-a-chip can mimic the whole organ and show how it will react to diseases or drugs administered targeting them. Laboratory work on diseases and drugs using miniature organs is much simpler and more effective. Organ-on-a-chip is basic but complex at the same time. It is a device with one or more biocompatible microfluidic chambers containing different cell types in 3D or 2D culture; living cells interact as much as they can as miniature. The chip architecture enables the cell cultures found therein to be continuously perfused and controlled mechanically or electrically. It imitates the natural physiology of the organs or can be used to cause disease pathology at the level of the organ and tissue. The researcher can even link chips that contain different types of organs and tissues at the same time. The miniature human models are not the same as the human body, therefore analysing the organ-on-a-chip is required to get the results. It comprises four key components, namely microfluidics, living cell tissues, stimulation or delivery of drugs, and sensing. This technology is being used worldwide by researchers, research is in progress to design and prepare multi-organ chip models too in order to achieve “Human-on-a-chip” in the future. With this, insights into normal human organ functioning and disease pathophysiology could be obtained as well as the safety and efficacy of drugs being investigated could be understood accurately.

Keywords: Organs-on-chips, cell culture models, microfluidics, pharmaceutical development

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