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3D Printing: Key to revolutionize biomedical industry

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Singapore: Nanyang Technological University (NTU) in Singapore is among the first in Asia to invest in 3D bioprinting technology for medical applications. The institute has invested around $30 million in 2014 to set up a 3D printing center, an upcoming technology set to revolutionize medical device and drug industry. US-based Stratasys, one of the biggest names in 3D printing and additive manufacturing solutions, also launched its 3D printing Demo Center in Singapore this year to enhance the experience of 3D printing for biomedical research. Researchers around the world are attesting that 3D printing can have potential applications in fields including research and development, diagnostics, personalised medicine, drug development, and testing. Though the technology is still at an early stage for application but promises huge success in future for the biomedical sector.

Bioprinting allows medical researchers to build an organ in a three-dimensional shape with the help of bio-ink, made from cells taken from the patient. The process ensures that the printed organ is genetically compatible with the patient and it is safe to implant the organ. With the application of 3D printing technology, a surgeon can accurately measure the size of the organ needed for individual patient's implant, leaving no room for error, through size mismatch or organ rejection.

Dr Chua Chee Kai, director, Additive Manufacturing Center at Nanyang Technological University (NTU) in Singapore explained that the high potential of 3D printing will come from the development of suitable bio-ink for different tissue engineering applications and through development of bioprinting strategies to produce tissue parts that can become commercial applications, such as toxicity studies, disease modelling, and for diagnostic applications.

Singapore-based start-up company, Bio3D Technologies, is one of the first companies to start bio 3D printing for biologics and non-biologics products. The company enables 2D or 3D or combination printing of living cells and other bio-materials such as proteins and bacteria to print different bio- and non-bio materials. The company explained that cells, bacteria, and proteins that are arranged in pre-determined layouts and structures, function more accurately and consistently in lab conditions comparable to naturally-occurring environments.

Market estimates

According to industry estimates, 3D printer manufacturing industry has grown rapidly in recent years and is expected to grow at an average rate of more than 22 percent annually from 2009 to 2014, totalling $1.4 billion. According to IBISWorld reports, the US market for 3D printer manufacturing will grow at a CAGR of 15.7 percent from 2014 to 2019.

Ms Linda Tian, analyst for medical devices at GlobalData stresses that over the next five years, the medical devices sector will see more partnerships between small contract 3D-printing service firms and large orthopaedic companies seeking to explore opportunities in this revolutionary technology.

"This will occur as the clinical community increasingly acknowledges the efficiencies of a service-based approach to personalized surgery that combines expertise in medical imaging, surgical simulation, and 3D printing," she highlighted.

According to the Singapore Economic Development Board, 3D bio-printing will reach commercialization in five years from now for printing human tissue, organs and other medical products and the phenomena will prevail not only in the US but also in Singapore.

Ms Rhenu Bhuller, senior vice president of healthcare at the research firm Frost and Sullivan, predicts that healthcare is expected to represent 16 percent of the total 3D printing industry in future, compared to less than one percent today.

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