Artificial Intelligence in advancement of Regenerative medicine & Tissue Engineering

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INTRODUCTION

Artificial Intelligence (AI) is a capability of a machine to exhibit intelligent behavior.

The major areas of AI are classified as:
- Reasoning, Programming
- Artificial life
- Data mining
- Distributed AI
- Expert systems
- Generic algorithms
- Knowledge representation
- Machine learning
- Neural networks
- Constraint satisfaction
- Theory of computation etc.

USEFUL APPROACHES OF AI

AI can be applied to any intellectual activity including medicines, tissue engineering and other therapeutics which are facing the challenges such as:
- Analysing large amounts of knowledge
- Complexity of problems
- Standardisation of methods
- Enormous human efforts and time
- Manual errors
- Difficult data handling and deriving conclusions
- Complex decision making
- Extreme precision

The major approaches of AI useful in this regard are:
- Knowledge based system
- Case Based Reasoning
- Artificial Neural
- Machine learning
- Robots & robotic devices

SOME APPLICATIONS OF AI

- Prediction of results with ANN: Je Xu et al used artificial neural networks with back propagation method to provide advisory information for vascular tissue engineering with 94.24% accuracy[4].

- AI in decision making: In the same study, schemes were generated with artificial intelligence with a search engine. Schemes hence generated helped to cure 18 out of 20 experimental animals.

- Automated Cell Processing Robot: Fully automated systems are able to process cells with high-quality efficiency, capable of handling multiple cell types simultaneously with other additional features like image processing.

- Robotics and automation in assisting regenerative medicine: Automated systems can provide methods for uniform culturing[5]. Robotic time-lapsed microscopic imaging system, High throughput screening can be used for in vitro stem cell tracking[6].

- Robot Based Rapid Prototyping System for scaffold fabrication: A desktop robot based rapid prototyping (DRRP) system was developed[8,9,10] which is capable of extruding biopolymer for freeform construction of 3D tissue engineering scaffold.

- Computational models based neural networks for complex tissue engineering: It is employed to develop optimal strategies for complex and sophisticated applications like peripheral nerve regeneration. Researchers are attempting to combine computational model based on Swarm Intelligence (SI) to engineer peripheral nerve tissues[11].

A PRACTICAL EXAMPLE

A simple MATLAB code has been used to detect edges of a picture provided as an example. More complex codes and algorithms can be used in a similar way to predict the dimensions of 3D objects such as a scaffold or damaged organs.

CONCLUSIONS

The conventional approaches of tissue engineering & regenerative medicine have certain drawbacks for which Artificial Intelligence and robotic devices offer high accuracy, speedy results, decrease effort.

Hence we conclude that artificial intelligence and automated systems will aid regenerative medicine and tissue engineering approach to become future revolution in therapeutics.

REFERENCES