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Neural Networks in the context of stem cell therapy, health and disease diagnosis

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ABSTRACT

A neural network is an interconnected group of neurons. Dendrites in neuron receive signals and soma amplifies the received signals when a particular threshold is reached, the signal is transferred by axon to other neurons by nerve endings and synapses. It is just like computers having an input layer receiving signal and hidden layer amplifying the signal and the output layer transferring the signal. Recently neural networks are receving a very good attention due to their use and application in research and development. Neural networks are nowadays used for separating a mixed population of cells which is very important for stem cell therapy, disease prognosis and tissue engineering. Neural networks are also used to assess motility and other biomechanical characteristics of individual cells. The ability of neural networks to assess cell motility can help in recognizing metastatic potential of cancer cells as well proinflammatory response of inflammatory cells. Nowadays mouse embryonic stem cells are differentiated into neural networks and these neural networks are used as for the detection of botulinum toxin of clostridium species.

Keywords: Neural network, input, output disease, cancer, botulinum.

I.INTRODUCTION

Neural networks have received a lot of attention recently. Neural networks are a group of interconnected neurons. Neurons receive signal from other neurons by dendrites and axon soma amplifies the received signal and axon transmits that signal to other neurons. Our neurons are just like computers where the input receives signal and the internal layer that is processor amplifies signal and the output which transmits the signal.(Figure 1a and Figure 1b)

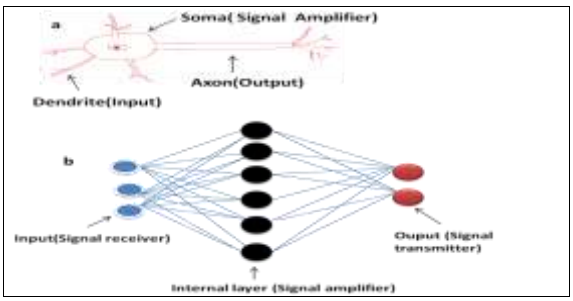

Figure 1: Similarities between computer and neuron (a) Neuron) (b) Computer

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II. NEURAL NETWORKS FOR STEM CELL THERAPY AND CELL SORTING

Neural networks can be used for enriching stem cell population from a mixed population of cells and these stem cells can be used for stem cell therapy and tissue engineering (Figure 2) [1]. Neural networks help in differentiating between different layers of articular chondrocytes and sorting of different layers individual layers[1].Based on different biochemical properties neural networks can be applied to cells of mesencymal origin, adipocytes and osteoblasts and these cells are separated into different nodes and each cell type is having an individual node [2, 3]. Neural networks can be used to assess proliferation of Hematopoietic Stem Cells in ex-vivo conditions [4].

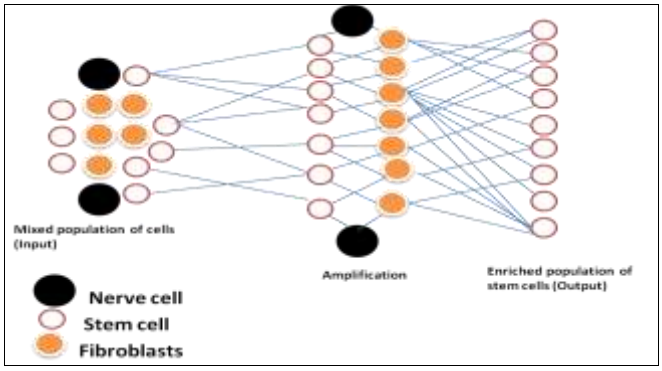

Figure 2: Separation of stem cells from mixed population of cells by application of neural networks

III. NEURAL NETWORKS FOR DETECTION OF CANCER, INFLAMMATORY AND HEART DISEASES.

Neural networks help in assessing motility of cancer cells by which metastasis can be assessed as well as the inflammatory response of cells like basophils, eosinophils, neutrophils; macrophages can be checked and can thus play an important role in treatment of cancer and inflammatory disorders [5-7].Artificial neural networks are currently used for the classification of heart diseases[8].

IV. NEURAL NETWORKS FOR DETECTION OF TOXINS

Mouse embryonic stem cells are differentiated into neural networks and these platforms have been successfully employed for the detection of botulinum toxin of clostridium species[9]. Artificial neural networks are used for determining quality of water[10].Artificial neural networks are also used for detecting mycotoxins in food items[11].

V. CONCLUSION

Use of neural networks for the diagnosis of diseases and for stem cell therapy is still under developmental stages. It it is expected that in coming years neural network systems can replace many conventional laborious

methods. In future it is expected that neural networks can make stem cell therapy easy as well as neural networks can help in prognosis and diagnosis of diseases in a better way.

REFERENCES

[1] Darling, E.M., S. Zauscher, and F. Guilak, Viscoelastic properties of zonal articular chondrocytes measured by atomic force microscopy. Osteoarthritis and cartilage, 2006. **14**(6): p. 571-579.

[2] Darling, E.M., et al., Viscoelastic properties of human mesenchymally-derived stem cells and primary osteoblasts, chondrocytes, and adipocytes. Journal of biomechanics, 2008. **41**(2): p. 454-464.

[3] Kohonen, T. and S.-O. Maps, Springer series in information sciences. Self-organizing maps, 1995. **30**.

[4] Fan, X., et al., Neural network analysis of ex-vivo expansion of hematopoietic stem cells. Annals of biomedical engineering, 2007. **35**(8): p. 1404-1413.

[5] Lyons, S.M., et al., Changes in cell shape are correlated with metastatic potential in murine and human osteosarcomas. Biology open. **5**(3): p. 289-299.

[6] Perl, J.r., A neural network approach to movement pattern analysis. Human Movement Science, 2004. **23**(5): p. 605-620.

[7] Aguilar-Lira, G.Y., et al., Artificial neural network for the voltamperometric quantification of diclofenac in presence of other nonsteroidal anti-inflammatory drugs and some commercial excipients. Journal of Electroanalytical Chemistry. **801**: p. 527-535.

[8] Khemphila, A. and V. Boonjing. Heart disease classification using neural network and feature selection. in Systems Engineering (ICSEng), 2011 21st International Conference on: IEEE.

[9] Jenkinson, S.P., et al., Embryonic Stem Cell-Derived Neurons Grown on Multi-Electrode Arrays as a Novel In vitro Bioassay for the Detection of Clostridium botulinum Neurotoxins. Frontiers in pharmacology. **8**.

[10] Kim, C.-K., et al., Implementation of wavelets and artificial neural networks to detection of toxic response behavior of chironomids (Chironomidae: Diptera) for water quality monitoring. ecological modelling, 2006. **195**(1): p. 61-71.

[11] Rajalakshmi, M. and P. Subashini, A study on non-destructive method for detecting toxin in pepper using Neural Networks. arXiv preprint arXiv:1208.2092.