

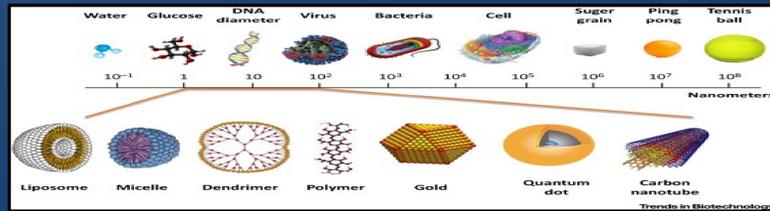
Biomedical Nanotechnology

The Face of New Medicine

Najiba Afzal, B.S. Candidate in Biological Sciences

Introduction

- While it is often thought that bigger is better, changes in technology have proved otherwise. The first computers and cellular devices were massive, but, as times change, our electronic devices have become smaller and smaller. The human body is generally considered as one big organism made of millions of cells that cannot individually be seen with the naked eye. A red blood cell is in the range of 10^{-6} meters and they are being treated with drug particles that are 10^{-4} meters in size. A drug particle is unable to directly inject itself in the RBC, and therefore many medical treatments have fallen short of their potential. I will focus on the advancements of nanotechnology in the treatment of neurodegenerative diseases.



Neurodegenerative Treatment

- The physiological aspects of these diseases often include neuron inflammation and protein misfolding which causes degeneration of the cell. The reason these diseases are untreatable is because of the blood-brain barrier. With the advancements in nanotechnology, nano devices will be used to aid in treatment of these diseases as they have the capability of overcoming this barrier.

NEURODEGENERATION

Neurodegeneration is an umbrella term for the progressive loss of structure or function of neurons.



Neurodegeneration can be found in many different levels of neuronal circuitry ranging from molecular to systemic.

Background

- Biomedical nanotechnology forms a hybrid between 2 rising fields in science today: medicine and technology. The mixing of these two fields can revolutionize the way we detect and treat growing diseases.
- Chemistry and the understanding of physiological reactions that occur in the human body on a day-to-day basis have been studied for many years. However, the ability to manipulate these reactions is a recent discovery and continues to grow with nanotechnology in the modern day.
- Biological molecules in the human body, specifically human cells, are on a micro level. Through the use of nanotechnology, researchers have gained the ability to alter the physical and chemical properties of molecules on a nano scale.

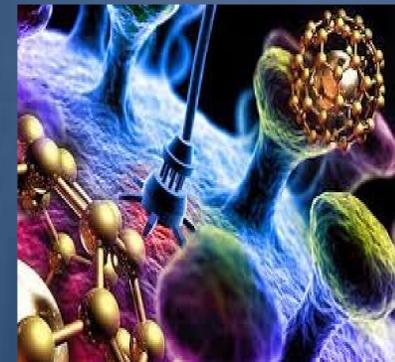
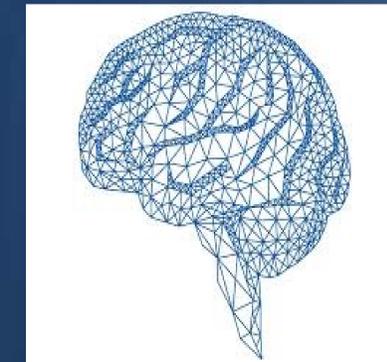


	a	b	c	d
	Dendrimer	Spherical fullerene	Cylindrical fullerene	Micelle
	e	f	g	h
	Liposome	Oil-in-water emulsion	Virus-like particle	Synthetic virus-like particle
Size	<5 nm	10–20 nm	50–100 nm	>150 nm
Nanoparticle	Dendrimer	Polymer	DNA polyplex	Liposome
Bioactivity	Partition like small molecules and filter through the kidney	Escape the vasculature, infiltrate the tissues and lymphatics like proteins	Penetrate the mucosal membranes and the skin and are taken up into cells.	Taken up mainly into phagocytic cells

Nature Reviews | Immunology

Significance

- Nanotechnology has created novel devices for the treatment of various neurological diseases. Efforts are being made to focus on nanoneuroscience for treatment of diseases that we once thought were incurable, including Alzheimer's disease (AD), Parkinson's disease (PD), amyotrophic lateral sclerosis (ALS), and multiple sclerosis (MS).
- Research is growing to treat diseases for which treatment was once unimaginable, including cancer, ND diseases and many more.
- With nanotechnology researchers are able to control cells from the inside to alter the metabolic processes.



Future of Nanotechnology

- Nanotechnology has the potential to generate therapeutic devices that will inhibit or reverse neuropathology of Alzheimer's and Parkinson's through promotion and functional regeneration of damaged neurons.
- Therapeutic devices will also provide protection of foreign molecules while simultaneously delivering neuroactives such as drugs, genes and cells across the blood brain barrier.



Contact information:

Najiba Afzal
General Biology
nafzal4@csustan.edu
CSU Stanislaus

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