Nanomedicine: A New Approach to Treating Neurological Disorders

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One of the most intriguing fields of science deals with the study of the human brain. This remarkable sponge-like mass inside our heads allows us to think, speak, and dream. It is difficult to imagine the problems that occur when one loses the fundamental abilities the brain provides. Indeed, many neurological disorders pose challenges that have yet to be understood and overcome. With the potential of the fast growing field of nanoscience, however, it may be only a matter of time before some of the greatest neurological mysteries of our era are unraveled. One of these, Parkinson's Disease, is an excellent example of a devastating neurological disorder that could benefit from the future applications of nanoscience.

Parkinson's Disease is a movement degenerative disorder of the central nervous system that is often characterized by muscle rigidity and tremors. The condition causes a severe impairment of speech and fine muscle control with various psychological symptoms also appearing as the disease progresses. Symptoms of the disease are caused by the death of dopamine neurotransmitter releasing neurons in the Substancia Nigra (SN) region of the brain; these neurons can no longer properly stimulate the motor cortex and initiate movements (Miller 2008).

So far, scientists have been quite successful in minimizing the symptoms of the disorder by the administration of the drug Levodopa. This drug is effective because it converts into dopamine in the brain. However, there are two significant problems that have been encountered with this treatment. First, the drug is administered orally, and must make its way into the brain to exert its effects. As a result, a considerable amount of the drug is lost before it reaches the target area in the brain. Second, when administered, dopamine acts upon a wider area of the brain than the SN region alone, resulting in a range of clinical side effects (Linazasoro 2008).

To overcome these problems, researchers are investigating the use of molecules called liposomes for drug delivery. Liposomes are specially engineered, nanoscale spherical vesicles composed of a lipid bilayer that surrounds an aqueous compartment (Linazasoro 2008). Drugs such as levodopa can be inserted into the aqueous compartment and thus be protected from the external environment as they make their way to the target site. In addition, these vesicles can potentially be tagged with receptors for recognizing the SN region so the contents will not be released until the vesicles reach this area of the brain (Linazasoro 2008). The liposomes would ensure a localized administration of the drug precisely where it is needed.

By efficiently protecting a drug and transporting it to a designated target area, nanoscale vesicles can improve the efficiency of drug delivery. In this way, nanoscience can and will play a significant role in improving treatments for Parkinson's Disease and many other devastating neurological disorders.

REFERENCES

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