



Review Article

Plant based Gold Nanoparticles and Penetration through Blood Brain Barrier

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ABSTRACT

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The blood brain barrier (BBB) is designated as one of the most vital shielding mechanism placed in central nervous system (CNS) regulating brain microenvironment. Selectively allowing only essential molecules like micro soluble lipids through capillary membrane while obstructing the passage to toxins and pathogens. This mechanism is termed as essential for normal well being of brain health; however, it also poses extreme challenges during disease state hindering the adequate drug delivery to effected region. In recent years there have been number of researches specifically exploring efficient drug delivery methods via penetration through BBB such as structural modifications in prodrugs via using liposome, micelles, dendrimers, carbon nanotubes, niosomes, beta cyclodextrin carriers etc or inducing osmotic disruption in BBB etc. However, most of such strategies failed to provide substantial proof to desired site specific activity across BBB. The current review here discusses plant mediated Gold nanoparticles (AuNP's) drug delivery system as a future transpiring non-invasive system for brain related diseases and disorders as neuroprotective agents. The scope of plants based AuNPs will be elaborated considering their recent advancement to research activity and propensity to devise into therapeutics with ability to act across BBB as targeted drug therapy. This could be a remarkable progress exploring green synthesis protocols towards gold nanoparticles, reformulating equivalent novel strategies to in place conventional methods for cerebral diseases.

1. Introduction

Despite of recent advancement to understanding of complex pathophysiological pathways associated to multiple neurological disorders, there have been exponential rise in its cases in recent years. This might be largely due to inefficient drug delivery system i.e. inadequate action of therapeutics to the specific disease site across the blood brain barrier (BBB). BBB is considered as the major obstacle to cerebral drug transport, acting as a natural barrier to most molecules entering to the brain. This mechanism is essential for neuro protection, however pours immense challenge to device and develops compatible treatment strategies that could deliver desired response across BBB[1,2]. Hence, unique drug delivery approaches are needed with the idea of utilizing macro molecules with the ability to deliver high drug concentration locally and nominal systemic adverse effects. Plant based gold nanoparticles (AuNP's) could be an ideal choice for brain targeting[3].

Nanotechnology in recent years has been immensely popular amongst researchers, for more efficient, alternative and

targeted drug delivery system. Nanoparticles derived through this technique; mostly bear controlled structure, unique features and potency to act as desired. However, the chemical & physical methods involved for their production are quite costly and unsafe for the environment. Considering to the fact, utilization of greener means for producing nanomolecules would add credit to much more environmentally friendly, on hazardous and biologically safe substances for treating human diseases[4-6]. Plant derived gold nanoparticles could be a potential method to physically and chemically produce desired greener bionanoparticles with the capacity to penetrate across BBB and therefore, they might lay the steadfast foundation to treatment of multiple neurological disorders. Moreover, plants and their extracts give large window to scale up the synthesis of nanoparticles.

At present, evidences suggest that multiple numbers of plants and their extracts have been used for synthesis of gold nanoparticles in order to meticulously target neurological disorders, especially with gruelling etiology and low therapeutics access. Plant such as *Medicago sativa*[7,8], *Hypericum perforatum*[9-11], *Ocimum gratissimum*[12],