

# Gold nanoparticles: A plausible tool to combat neurological bacterial infections in humans

Rizvi S.M.D.

Hussain T.

Ahmed A.B.F.

Alshammari T.M.

Moin A.

Ahmed M.Q.

Barreto G.E.

Kamal M.A.

Ashraf G.M.

Management of bacterial infections of central nervous system is a major challenge for the scientists all over the world. Despite the development of various potential drugs, the issue of central nervous system infections persists in the society. The main constraint is the delivery of drugs across the blood brain barrier and only a few drugs after meeting the stringent criteria could cross the blood brain barrier. On the other hand, certain bacterial pathogens could easily enter the brain by using several factors and mechanisms by crossing the blood brain barriers. Interestingly, in the recent past, gold nanoparticles have shown immense potential to overcome the issues associated with the treatment of central nervous system infections, especially due to their inherent ability to cross the blood brain barrier. Initially, the present review summarized the recent updates on the pathogenesis and factors involved in neurological bacterial infections, including the mechanism used by bacterial pathogens to cross the blood brain barriers. Thereafter, the emphasis of the review was on providing current information on gold nanoparticles pertinent to their applicability for the treatment of neurological infections. After discussing the background of neurological bacterial infections, the characteristic features, antibacterial properties, mechanisms of antibacterial action and ability to cross the blood brain barrier of gold nanoparticles have been summarized. Some of the features of

gold nanoparticles that make them an ideal candidate for brain delivery are biocompatibility, stability, ability to get synthesized in different sizes with facile methods, surface affinity towards various functional groups, spontaneous crossing of blood brain barrier without applying any external field and most importantly, easy non-invasive tracing by CT imaging. The current updates on the development of gold nanoparticles based therapeutic strategies for the prevention and treatment of central nervous system infections have been discussed in the present study. However, further investigation would be required to translate these preclinical outcomes into clinical applications. Nevertheless, we could safely state that the information gathered and discussed in the present review would benefit the scientists working in the field of neuro-nanotechnology. © 2018 Elsevier

Masson SAS

Bacterial meningitis

Blood brain barrier

Drug delivery

Gold nanoparticles

Nanotechnology

Neurological bacterial infections

functional group

gold nanoparticle

antiinfective agent

gold

metal nanoparticle

antibacterial activity

bacterial translocation

blood brain barrier

brain infection

central nervous system infection

computer assisted tomography

human

nanotechnology

nonhuman

pathogenesis

priority journal

Review

surface property

animal

bacterial infection

central nervous system

chemistry

microbiology

pathology

Animals

Anti-Bacterial Agents

Bacterial Infections

Blood-Brain Barrier

Central Nervous System

Gold

Humans

Metal Nanoparticles