Opinion Article

iMedPub Journals
www.imedpub.com

British Biomedical Bulletin
ISSN 2347-5447

2021
Vol. 9 No. 3:13

Raw and Functionalized Clay Minerals: Bioactivities, Biomedical, and Pharmaceutical Applications

Arshita Jindal*

Department of Biotechnology, Meerut Institute of Engineering and Technology, Meerut, U.P, India

***Corresponding author:** Arshita Jindal

arshitajindal59@gmail.com

Department of Biotechnology, Meerut Institute of Engineering and Technology, Meerut, U.P, India.

Citation: Jindal A (2021) Raw and Functionalized Clay Minerals: Bioactivities, Biomedical, and Pharmaceutical Applications. Br Biomed Bull Vol.9 No.3: 13.

Abstract

Clay minerals are alumino-silicate minerals that are very common in nature and produce low-cost products. Clay minerals chemical and biogeochemical features are of interest to scientists. Several nanostructured clay hybrid materials derived from ion exchange and covalent bonding have been developed for environmental applications such as the removal of inorganic contaminants, herbicides, and insecticides from solution. Clay minerals and their derivatives have a wide range of biological characteristics. They play an important role in microbial inhibition, which is influenced by a variety of parameters including pH, the presence of metals and metal ions, and a variety of processes. Clay materials have seen an increase in biomedical and pharmaceutical applications in recent years, owing to researchers' interest in developing low-cost alternative materials for problem solving in medicine and pharmaceutical science. Clay minerals and their derivative materials are widely used as dietary supplements, medicinal formulations and delivery methods, dermatology, pelotherapy, and fangotherapy in various sectors. Clay minerals are also used orally to help calm the intestines and eliminate pollutants.

Received: June 05, 2021, **Accepted:** June 15, 2021, **Published:** June 25, 2021

Introduction

Clay minerals are alumino-silicate minerals that are found as deposits in many places of the world. They can be found in nature as huge or little deposits that cover the earth's surface. They are the key basic materials in adsorbents, cosmetics, medicines, paints, veterinary medication, and biocides, and they are a substantial component of soils in which plants thrive. Clay minerals, both raw and modified, as well as compounds synthesised from minerals like kaolinite and smectite, have long been used to cure a variety of human diseases and maladies, particularly those of the digestive tract, in many regions of the world. Clay minerals have a wide range of applications due to their chemical, geotechnical, and biological properties. Clay minerals are made up of a variety of elements, including transition metals that can interact with soil microbes. Microorganisms may find certain elements useful or poisonous. Some elements may provide minerals for various biological functions, while others may be hazardous to living things. Clay minerals chemical makeup has a big impact on the types of microorganisms that can live in their phyllospheres and environments.

Clay minerals chemical and geobiological characteristics mediate interactions between clays and microorganisms, resulting in a variety of interaction mechanisms. Clay minerals are recognised to be biocidal in nature, suppressing a variety of microbes. Mineral pH, metal and metal ion presence, ion exchange, and adsorption characteristics are all frequent factors that cause microbe inhibition. Clay minerals have been used extensively in biomedical science, particularly in the fields of medication delivery, healing of various diseases and disorders, nutritional supplement sources, dermatology, and drug formulations. Clay minerals are commonly used in therapeutic formulations to increase drug solubility, stabilise photo-unstable pharmaceuticals in the presence of UV light, and slow the rate of release. As a result, they are classified as biomaterials with low biological activity. Montmorillonites are the clay minerals that have been studied and used the most.

Many researchers have investigated clay mineralogy for several years, resulting in advancements in its uses. Recent developments in the characterization and evaluation of clay minerals have resulted in three general classes of clay minerals based on layer types. Clay minerals are classified according to the quantity and arrangement of tetrahedral and octahedral sheets found in their fundamental structures. Clay minerals are classified as 1:1 (e.g. kaolinite), 2:1 (e.g. smectite and vermiculite groups), and 2:1:1 (e.g. chlorite). Clay minerals may now be classified into five groups

because to advances in instrumentation for characterization and mineralogical evaluation. Kaolinite, illite, chlorite, smectite, and vermiculite are the minerals. Clay minerals are made up of hydrous aluminium layer silicates that have mica-like structures.

Clay minerals produced from biological origin are known as bio-clays. Biological entities, such as bacteria, produce them as a result of their metabolic activity. Microorganisms can create clay minerals, according to some researchers.

Clay minerals activities on microbes have been mostly described by their inhibitory effects. The majority of research on the impact of clay minerals on bacteria has focused on their antimicrobial properties mediated by abiotic causes. In recent years, the use of naturally occurring clay minerals as an antibacterial agent has gotten a lot of interest, notably for treating human diseases. The synergistic activities of Fe (Iron) and Al (Aluminium) in clay obtained from volcanogenic hydrothermal alteration kill microorganisms.

Natural clay minerals are often used in the form of suspension as a dietary mineral supplement, a cleansing agent, and an allopathic treatment for acute and chronic diarrhoea. Geophagy is the deliberate ingestion of soil elements such as clays by animals and humans. Geophagy is a little-understood practise that has been linked to cultural customs, religious beliefs, medicinal advantages, psychiatric illnesses, and dietary/nutritional requirements.

Clay minerals have a number of advantages in the Drug Delivery System (DDS), including fewer side effects, quick transportation processes, and low toxicity. Because of their rapid, safe, and efficient carrying methods, new organic and inorganic clay hybrid materials have been produced and widely explored for their application in drug delivery systems and diverse pharmaceutical formulations in the last two decades.

Several studies have revealed that clay minerals, both in their natural and modified forms, have physiologically active qualities. Clay materials' bioactivities are determined by their chemical composition and biogeochemical characteristics. The chemical makeup of the materials utilised has an impact on a microorganism's susceptibility. Clay minerals have restorative and medicinal characteristics; they're employed as nutritional supplements, in medicine formulations and delivery systems, in cosmetics, dermatology, and mud treatment, among other things.