



The Therapeutic Uses of Medicinal Clays in Pharmaceuticals to Improve Health of Human Beings

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Abstract

Clay minerals can be beneficial to human health by serving as active principles or excipients in pharmaceutical preparations and in beauty therapy medicines. The use of clay as medicinal clays in folk medicine in human beings goes back to prehistoric times. Even up to today, the indigenous people around the world still use the clay, which is related to geophagia. The aim of this review is the therapeutic uses of medicinal clays in pharmaceuticals to improve the health of human beings. A literature review done yielded that medicinal clays are used externally and may be applied in several different form powders and baths. There are used as antiseptics, cicatrizing agents, anti-inflammatories, anti-carcinogenic agents, emollients, refrigerants, and cosmetics. When taken internally, there are powerful detoxifiers and also provide minerals and trace minerals and have colloidal properties that eliminate toxins from the bodies. The value of medicinal clays have been studied and proven in research as having inherent healing properties in developed countries. It therefore recommended that further studies be done on the effectiveness of these clays in the maintenance and recovery of health in human beings in developing countries like South Africa.

Keywords: *Medicinal clays, pharmaceuticals, diseases, human health, curative therapy*

1. Introduction

The use of medicinal clays in folk medicine goes back to the prehistoric times (Carretero et al. 2006). The first recorded use of medicinal clay was on Mesopotamian clay tablets around 2500 B.C. Pharaohs used this material as anti-inflammatory and antiseptic agents (Carretero et al. 2006). It was also reported that Cleopatra, the Queen of Egypt, used clays to preserve her complexion (Veniale, 1997; Reinbacher, 1999).

The commonest clays used for medicinal purposes are kaolin, bentonite (calcium bentonite clay), montmorillonite (calcium montmorillonite Clay) and Fuller's earth used internally and externally as purification aids to detoxify, and heal wounds. Internally clay packs were used in skin cancer treatment, for inflammation and extreme painful irritation of the skin lesions (Haydel, 2008). In modern research medicinal clays have been reported to possess certain properties which include: antibacterial, absorptive and adsorptive.

1.1 The use of clays in pharmaceutical preparations

According to Bolger (1995) Visera (1999), Lopez-Galindo (2000) and Carretero (2002), clays have fundamental properties of having high specific area and adsorptive capacity, favourable rheological characteristics, chemical inertness. Clays also present low or null toxicity for the patient and are of low cost (Carretero et al., 2006). There are used for therapeutic purposes in pharmaceutical formulations as active ingredients or excipients. These properties were investigated by several authors and there are commercially medicines that include sepiolite in its composition (as active principle and excipient (Ueda, 1992; Cerezo et al., 2001).

1.2 The use of clays as active principles

Clays are used as gastrointestinal protectors, antacids, and antidiarrheals; they can be administered to the patient orally in form of tablets, powders, suspensions, and emulsions. Clays are also applied topically (to the body's exterior, or a limited portion of the body) as dermatological protectors or for cosmetic reasons. Examples of these clays are kaolinite and palygorskite used as gastrointestinal protectors. Their therapeutic action is based on their high specific area and adsorptive capacity. They adhere to gastric and intestinal mucous membrane and protect them, and can absorb toxins, bacteria, and even viruses. However their prolonged use is unadvisable because they can also eliminate enzymes and other necessary nutritive elements (Carretero et al., 2006).

Some other clays like smectites are used as antacids due to their poor hydrogen ion neutralizing capacity and so are indicated in the treatment of gastric and duodenal ulcers. Others are used as antidiarrheals due to their high water adsorption capacity. By eliminating the excess water from faeces, the material becomes more compact. For example Calcium smectites are used as antidiarrheals due to the astringent action of the Ca^{2+} ion, which forms non-soluble, hydrated phosphates (Carretero et al., 2006).



1.3 Antibacterial properties

Clays that possess antibacterial properties include smectites and illite clays (montmorillonite/bentonite type of clay) because they are iron-rich and therefore effective in killing bacteria in vitro (Haydel et al. 2008). The mechanism of action reported in this study is that the clay mineral exhibits bacterial activity against *E. coli*, Extended-Spectrum Beta-Lactamases (ESBLs) *E. coli*, *S. enterica* serovar Typhimurium, *P. aeruginosa*, and *M. marinum*, and significantly reduces growth against, *S. aureus*, Penicillin-binding-resistant *Staphylococcus aureus* (PRSA), Methicillin-resistant *Staphylococcus aureus* (MRSA) and non-pathogenic *M. smegmatis*.

Their antimicrobial activity specifically in acute infections of the alimentary canal is due to their special physical characteristics, above all in the distribution of their minute particles. If the infected mucous membranes are more or less flooded with clay, the bacteria are completely surrounded by clay particles thus separated from their source of nourishment. Thus growth and survival of the bacteria is inhibited, resulting in speedy relief of the symptoms of the acute infection (Haydel et al., 2008).

Another study that was performed in more than 20 different clay samples around the world, including the bentonite-type clays, achieved promising results against MRSA superbug infections and disease (Rehm, 2008).

Falkinham et al. (2009) used red clays from the kingdom of Jordan (Jordan's Red Soil) to test their antibiotic and antimicrobial activity and concluded that the antibiotic activity of Jordan's red clays was likely to be due to the proliferation of antibiotic-producing bacteria, induced by the clay.

1.4 Clays as trace minerals

Clays contain massive amount of minerals that are necessary for our good health. For example Montmorillonite clays contain as many as 75 % different trace minerals (US Patent, 2009). This explains why clays possess healing properties. These trace minerals include iron, zinc, manganese, magnesium and other minerals. The amount of trace minerals in specific clay vary according to the location. For example the amounts of iron in various bentonite clays vary from well below 1 %, and up to 10% (Carretaro et al., 2006).

Other therapeutic properties are due to their actions as delivery vehicles for micro, macro and trace minerals like calcium, magnesium, iron, potassium, silica, copper, chromium, and zinc and all in bio-available form. All these minerals are needed in humans to support strong bodies necessary for good health (Zheng et al., 2007).

1.5 Absorptive properties

Types of clays – attapulgite and palygorskite which are somewhat similar to bentonite have absorbent properties. When used in medicine, it physically binds to acids and toxic substances in the stomach and digestive tract. For this reason, it has been widely used in several anti-diarrheal medications (Cornejo, 1990).

Another type of clay in question is Kaolin known as “white cosmetic clay” is also widely used as an anti-diarrheal medication (Carratero et al., 2006).

The Amargosian Indians in India, and the natives in Mexico, Central and South America, and some tribes in Africa, used clays as purgatives and for diarrhoea relief (Cerezo et al., 2001). Today, osteopaths, naturopaths, and other healthcare professionals using alternative medicines do recommend Bentonite to patients for detoxification. A well-known dentist in his 30s, Dr Weston A. Price found out that natives of knapsacks contained food smothered in a ball shape with clay. This helped to prevent what was called “sick stomach (Carretero, et al., 2006).

Montmorillonite has healing effects on gum diseases, sore mouths, ulcers, skin rashes, amoebic dysentery, haemorrhoids, infected wounds and bites. It is believed that Montmorillonite which is called “Living Clay” has particles that are smaller than many bacteria; so when bacteria encounter an environment abundant in clay it becomes surrounded by the clay, and imbedded in it. The immediate result is that the bacteria are unable to receive nourishment and therefore cannot survive leading to their death (Carratero et al., 2006).

1.5.1 According to Barbs Newsletter (2011) mantmorillonite has the following unique properties:

- (1) The right deposits are among of the most powerful detoxifying natural substances on earth. It is believed to have a zeta potential or drawing power at high pH.
- (2) As a compound it can act as a delivery vehicle for minerals to the skin and body when ingested.
- (3) When hydrated to a paste, it can draw oils and toxins from the skin.
- (4) It is a powerful adsorbent that can attract heavy metal and toxic cations into and onto the particles, neutralizing pathogens and toxins.
- (5) Mantmorillonite tends to have a relatively high pH.
- (6) It has particles whose sizes include very small colloids and electrolytes.



- (7) The right deposit of this “Living clay” contain a portfolio of macro, micro and trace minerals like calcium, magnesium, iron, potassium, silica, copper, chromium, and zinc all in bio-available form.

1.6 The use of medicinal clays in external use

1.6.1 Mud baths

Clays are used in mud baths in form of health baths for the benefit of bathers. These clays are kaolinite and smectites that are used in spa and beauty therapy. There are used for the following properties as stated by Carretero et al. (2006):

- (1) Softness and small particle size.
- (2) Appropriate rheological properties for the formation of a viscous and consistent paste
- (3) Good plastic properties for easy application and adherence to the skin during treatment.
- (4) High heat retention capacity

1.6.2 Skin infections

Many skin infections have been healed by the application of medicinal clay (this was already noted in ancient times by Galen). For example, montmorillonite has shown its effectiveness in healing skin infections (Lee et al. 2008) and its usefulness for tissue engineering (Zheng et al. 2007). According to Carretero et al (2006), clays can eliminate excess grease and toxins from skin, and hence are effective against dermatological diseases such as boils, acne, ulcers, abscess, and seborrhea. Clay is also used in many dermatological over-the-counter remedies, such as in acne treatments, though this information may not be mentioned on the label specifically.

1.6.3 Use in Bandages

The Naval Medical Research Centre in April 2008 announced the successful use of a Kaolinite-derived aluminosilicate nanoparticles infusion in traditional gauze known commercially as “Quick Clot Combat Gauze.” Clays are used as dermatological protectors. They can adhere to skin, forming a film that mechanically protects the skin against external physical or chemical agents. By absorbing the skin’s secretions, and creating a large surface for their evaporation, they also have a refreshing action. Surface evaporation also promotes a gentle antiseptic action as it produces a water-poor medium that it is unfavourable for the development of bacteria (Veniale, 1997).

1.7 Use of clays as Excipients

Some clays like kaolinite, talc, palygorskite, and smecties are used as excipients in cosmetics and pharmaceutical preparations. According to Carretero (2002), clays function as:

- (1) Lubricants to ease the manufacture of pills
- (2) Aids to aid disintegration through their ability to swell in the presence of water, or through the dispersion of fibres, promoting release of the drug when it arrives in the stomach; and
- (3) Emulsifying polar gels and thickening agents because of their colloidal characteristics by avoiding segregation of the pharmaceutical formulation’s components and the formation of sediment that is difficult to re-distribute.

1.8 Internal use of medicinal clays

According to one theory by Ubick (2005), “In the stomach, the negative electrical charges of tiny clay particles attract positively charged toxins from fluids. Therefore this clumping prevents very small particles such as toxic molecules, from passing through the walls of the intestines and entering the bloodstream.” It was further noted that together with the clay, the toxins are then eliminated harmlessly out of the body through the kidneys, despite not entering the bloodstream, or through the bowel.

There are many, over the counter (OTC) remedies for internal use that contain clay. Examples of these clays are the tablets such as kaopectate and rheaban. The label of all these clays shows the active ingredient to be attapulgit, each tablet containing 600 or 750 mg of this compound along with inert material or adjuvants (US Patent, 2009).

Internal uses of clays for example kaopectate tablets are used to soothe an upset stomach. Kaolin has been used as an active substance in liquid anti-diarrhea medicines such as kaomagma. Such medicines were changed away from aluminium substances due to a scare over Alzheimer’s disease, but have changed back to compounds containing aluminium as they are most effective (Carretero et al., 2006).

1.8.1 Candida

Bentonite has been proven to be effective in the treatment of *Candida albicans* infections (Carretero, 2002). *Albicans* is a type of fungus (or yeast), which is a causal agent of opportunistic oral and genital infections. This type of infection called Candidiasis, also may enter the bloodstream, and become a systemic *Candida* infection. Maignan and



Pareilleux (1971) studied the influence of bentonite clay on the growth of *Candida lipolytica*. The authors observed a clearly unfavourable effect of bentonite on *Candida lipolytica* growth in vitro.

1.8.2 Heavy metal chelation

These clays are used as chelating agents to detoxify poisonous metal agents such as mercury, arsenic, and lead by converting them to a chemically inert form that can be excreted without further interaction with the body, to treat cases of severe heavy metal poisoning (Carretero et al., 2006).

1.8.3 Irritable bowel syndrome

It has been reported that beidellitic montmorillonite is efficient for C-IBS patients suffering from constipation-predominant bowel syndrome (Ducrotte et al., 2007).

1.9 Aflotoxins

Bentonite clay has been proven to show a very strong protective effect against Aflotoxins. These are naturally occurring mycotoxins that are produced by many species of *Aspergillus*, a fungus. These are toxic and are among the most carcinogenic substances known, causing aflotoxicosis. Abdel-Wahhab et al. (1988) in a study stated that “The addition of bentonite or hydrated sodium calcium aluminosilicate (HSCAS) to the AF-contaminated diet diminished most of the deleterious effects of the aflatoxin.” Pathological examinations of the liver and kidney proved that both bentonite and HSCAS were hepatonephroprotective agents against aflatoxicosis.

1.10 Use during pregnancy

It was also reported that pregnant women in indigenous and traditional cultures consume clays to reduce nausea and since they contain minerals that contribute to the development of a healthy foetus. Scientist analyses of clays selected by pregnant women in Nigeria showed that eating as little as 500 mg (about the equivalent of two tylenol capsules) per day can satisfy nearly 80 percent of a pregnant woman’s calcium needs (Abdel-Wahhab et al., 1988).

2 Conclusion

The value of medicinal clays were studied and proven in research as having inherent healing properties in developed countries. Medicinal clays are used for therapeutic purposes in pharmaceutical preparations and have beneficial effects on human health. They are used as active principles as gastrointestinal protectors, antacids, antidiarrheals, dermatological protectors, cosmetics as well as external excipients as inert bases, delivery systems, lubricants and emulsifiers. It is worth studying their effectiveness in the recovery and maintenance of human health in developing countries like South Africa.

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