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Review Article

Review of Therapeutic Clays Used in Reference to Unani System of Medicine

Md Shahbaz Alam[1], Hamiduddin[2,*], Ghulamuddin Sofi[3], Mohd Akhtar Ali[4]

[1]Department of Ilmul Advia, ZH Unani Medical College and Hospital, Siwan, Bihar, INDIA.
[2]Department of Ilmul Saidla, National institute of Unani Medicine Bengaluru, Karnataka, INDIA.
[3]Department of Ilmul Advia, National institute of Unani Medicine, Bengaluru, Karnataka, INDIA
[4]Department of Ilmul Saidla (Unani Pharmacy), State Unani Medical College and Hospital, Prayagraj, Uttar Pradesh, INDIA.

ABSTRACT

Nature and health has always remained in consonance with each other. Various natural resources have got therapeutic purpose apart from their use in other industries. Clays from nature have been used frequently for therapeutic purposes from ancient times. The external use for stopping bleeding and their internal use for various ailments have been documented from early Greek civilization and Unani system of Medicine. Survey of literature from index journal, available Unani classical text, and authentic books and websites were carried out about therapeutic clays, their nomenclature, uses and rationale for their use was noted. Dioscorides has mentioned a number of clays in his book Materia Medica. Work of other Unani/Arab scholars *AbūRayḥān al-Bīrūnī, Ibn al-Bayṭār, Hunayn Ibn Isḥāq al-ʿIbādī, Abū Bakr Muhammad ibn Zakariyyā al-Rāzī, Ibn Sīnā, Abul Qasim Khalaf ibn al-Abbās al-Zahrāwī* on clays etc is been shortlisted in this work. Unani system enriched by vast literature extending from Greeks to Indian scholars bridged by the Medieval Arab scholars of medicine have left great legacy in regard to the description, use, and indication of various types of therapeutic clays, which are remedy for various diseases as a haemostatic, detergent, resolvent, astringent, wound healing etc, and also used as a cosmeceuticals and cosmetics. Present review attempted to enumerate the various aspects of different types of clays used in Unani system of medicine for therapeutic purposes.

Keywords: Medicinal Clays, Unani Medicine, Gil, Tīn, Bole, Therapeutic clay.

Correspondence:
Dr. Hamiduddin
Associate Professor, Department of Ilmul Saidla, National Institute of Unani Medicine, Bengaluru-560091, Karnataka, INDIA.
Email id: drhamid2003@rediffmail.com

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INTRODUCTION

The application of therapeutic Clay or mud, have been used from time immemorial for treating diseases and trauma. Through the centuries, the indications and methods of using this earthy matter for medical purposes was established empirically.[1] In prehistoric era, the earliest utility of clay as a medicament was 5,000 years ago, in this era clay was listed as a wound-healing medicament in tablets of Nippur,[2] and also used to treat ailments such as pain and food poisoning. They even used clay as cosmetic for beauty treatments and spa.[3] Ebers Papyrus 1600 BC is also documented as the ancient medical source, advised clay for dysentery, diarrhoea, hookworm, tapeworm, wounds and abscesses.[2]

Ancient Egypt also describes use of clay in Rheumatism associated as chronic aches and pains in the neck, limbs, and joints, treatment of this pains included massages with clay or mud and ointments containing herbs, animal fat, honey, wine dregs and other materials.[4]

Another written reference known to exist with a description of their mineral and its benefits, dates to Rome, 60 BCE. Throughout ancient history, clay has been used topically for soothing the skin, and internally for gastrointestinal issues. Aristotle (384–322 BCE) made the reference regarding deliberate eating of clay by humans for therapeutic and religious purposes.[5]

Various kinds of "earths" have been used as medicines for hundreds of years. Famous for his knowledge of drugs, Galen (130–200 or 210 AD) investigated the properties of simple medicines, complex concoctions, and also several exotics from distant places, such as "Balm of Gilad" from Palestine, Lemnian Earths from the island of Lemnos. Lemnian Earths, or "Seals," were packets of specially prepared clay (much like Kaopectate) with the seal of the goddess stamped on them. Galen recommended these packets of clay for use against poisons, bites of serpents, and putrid ulcers. He also cautioned consumption of some forms of clay and similar impure materials could be dangerous.[6]

Later, Marco Polo (1254-1324 CE) in his travels describe that he saw Muslim pilgrims cure fevers by ingesting "*Tīn Azraq*"(pink

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clay).[5] Still in present era clays are used for preventative care, as remedies, and for obtaining minerals. Indian, American and African tribes use clays for their ceremonial healing procedures. Many of them would carry balls of dried clay in their bags, and dissolve a small amount of clay in water for drinking it with meals, for prevention of poisoning.[7] Clay is formed as a result of volcanic activity subjected to environmental influences both physical and chemical, over a period of time, these clays differ in composition and structure depending upon the source, each source has its own unique mineral compositions. Clays can absorb large amounts of water; many types of clay can expand immensely upon hydration. Clays can absorb minerals, metals and organic substances.[7,8] Medicinal clay constitutes a homogeneous thinly-dispersed plastic mass composed of water, mineral and organic substances which possess certain thermal properties, according to their source which determines their properties and composition.[1]

Arthur Macgregor (b. 1941 CE) gives a brief overview of the historical utilization of the medicinal clays known as *Terra sigillata* or 'Sealed earths'. Tracing its history from classical roots on the Greek Islands, particularly Lemnos and its neighbors, MacGregor concludes by considering the range of therapies in which they were utilized historically in the light of modern research.[9] In Unani system of medicine different clays are described like *Tīn Makhtūm* (Yellow chalk), *Tīn Qaymūliya* (*Terra cimolia*), *Tīn Armanī* (*Bole Armeniac / Bolus Armenia rubra*), *Tīn Multānī* (*Solum fullonum*) etc.[10]

Conventional uses for Clay

Each type of clay has its own beneficial uses, dependent upon its source, properties and chemical composition. Clay also contains some antibacterial properties Clays have a very important place for their use health and beauty purpose. They are widely used in mud spas, clays are mixed with water termed as geotherapy (poultices made from clay or mud is used), mixed with sea or salt lake water, or minero-medicinal water, and then matured (pelotherapy), or mixed with paraffin (Para-muds). In geotherapy and pelotherapy the application form of clay can be face masks, cataplasms / plasters, or mud baths, depending on the body area which is to be treated.[7] Commonclay used for skin conditions, as spa and beauty treatments is Bentonite clay, it improves the thermal stability and control release of naproxen.[11] Bentonite clay is formed by volcanic ash which weathered and aged in the presence of water. When Bentonite clay is mixed with water it swells open like a sponge, and can absorb water 40 to 50 times of its weight. There are a few types of Bentonite clay which are named due to dominant element present in them. Types of bentonite clay are Calcium Bentonite, Sodium Bentonite, Aluminium Bentonite, and Potassium Bentonite, each possesses unique benefits. Although it is important to know sources of clay and to learn the benefits and risks of their use, clay can be of great benefits to various beauty procedures, with amazing benefits.[7] Clays are also used for their ability to tone, tighten, and exfoliate the skin.[7] Many of the clay groups are used in treatment for medical problems both externally and internally. They can be used externally for pain relief or to protect and heal scrapes and cuts. Some uses of clay since ancient time includes in pharmaceutical formulations, for oral and topical applications, to stop bleeding of different body organs including eyes, gastrointestinal protectors, dermatological protectors, cosmetics such as hair and skin wash, tonic, and improving skin complexion, and as pharmaceutical

Table 1: Important clays mentioned in Unani System of medicine with their medicinal indications.

Sl. No.	Common/Unani Name	English/ Scientific Name	Pharmacological actions and indications (Indic.)	Doses and forms
1.	*Tīn Mutlaq* [15,35] *Gil Mutlaq*	Common Clay	Desiccant, detergent. Indic.: cosmetic, swelling.[15]	As required Paste.[30]
2.	*Tīn Armanī,* *Gil Armanī* [15,41]	Armenian bole,[26] (Bolus *Armenia rubra*)	Styptic, desiccant,[15] resolvent, analgesic, healing ulcer,[29] haemostatic,[32] astringent,[30] drug of choice for haemoptysis.[41] Indic.: Epistaxis, peptic ulcers, diarrhea, haemoptysis,[32] unhealing ulcers, asthma, corrhyza, viral fever.[14] cough, *Zufeqalb* (weakness of heart), inflammation,[27] tubercular ulcer, gastric ulcer,[31] fever.[35]	1-3g[27] 1-7 g[30] Paste powder ointment.[35]
3.	*Tīn Makhtūm*,[15,30,35] *Maghrah kāhenā*,[14] *Gil Makhtūm*	Yellow chalk,[28] (*Terra sigillata*)	Haemostatic, glutinous, wound healer,[14] exhilarant, cardiotonic.[32] Indic.: Poisoning epidemic disease,[32] palpitation, haemoptysis, plaque, tubercular ulcer.[26]	Infusion, powder, 1-3g.[28,32]

Sl. No.	Common/Unani Name	English/ Scientific Name	Pharmacological actions and indications (Indic.)	Doses and forms
4.	*Tīn Khurāsānī*,[30] *Gil Multānī*	*Solum fullonum*	Stomachic,[35] obstruent, resolvent[30] haemostatic, detergent, sedative,[31] astringent, thermo regulator, hair grower, antipyretic, exhilarant.[28] Indic.: Cholera, salivation, *Zufemeda*, nausea vomiting,[30] epistaxis, haematuria,[27,29] Pleurisy.[42]	9g,[30] 7-12g infusion.[27,31] Powder,3-5g.[31] 1-3g[27,28,31] paste.[42]
5.	*Tīnāl Maghrah*,[15,35] *Tīn Ahmar, Gerū*,[29,41] *Gil Ahmar*	Red clay (Silicate of Alumina and oxide of Iron)	Desiccant, anthelmintic, astringent,[35] mucilaginous, haemostatic, derivative, blood purifier.[27] Indic.: Diarrhea,[35] asthma, cough, epistaxis, gastric ulcer, uterine ulcer,[15] menorrhagia, gonorrhea, burning micturation.[27]	1-3 g, powder paste,[27] 12g Infusion.[29]
6.	*Tīn Qaymūliyā*,[15,35] *Kharyā Mittī*,[35,29] *Chiknī mittī*,[43] *Gil Qaymūlyiā* *Hajar Rukhām*	*Terra cimolia*	Absorbent, desiccative, haemostatic, anti diarrhoeal,[28] Frigorific, resolvent. Indic.: Gastritis, wound and ulcer,[35] boils, orchitis.[32] Parotitis, testicular hardness.[15]	3 g[28] Paste.[15]
7.	*Tīn Shāmūs*,[15] *Tīnul Kawkab*,[41]	Chalk / Marble / calcium Carbonate	Sedative, glutinous,[35] haemostatic, viscid, adhesive, agglutinant[15] Indic.: Mastitis, bleeding, parotitis, gout.[15,35,25]	Powder, paste.[30]
8.	*Tīn Rūmī* [30] *Gil Rūmī*	Romanian clay	Roughning, astringent, resolvent, haemostatic. Indic.: blephritis, bleeding, peptic ulcer, dysentery.[30]	1g powder.[30]
9.	*Tīn Misrī* [30] *Gil Misrī*	Egyptian clay	Detergent, roughning, astringent, glutinous[30] Indic.: ascites, bleeding diarrhea, pile.[30]	Powder.[30]
10.	*Tīn al Kārā*,[15,35] *Tīn kirmī*,[30]	Syrian clay	Desiccant,[15,35] roughning, resolvent, astringent, laxative, haemostatic[30] Indic.: Bleeding, swelling. Facial, erysipelas, scabies.[30]	7 *gm.*[30]
11.	*Tīn Mastagī*,[30,35] *Tīnbilād al Mastagī*,[15] *Gil Mastagī*	Mastic clay	Detergent, irrigator,[30,35] meat grower (stimulates granulation),[35] deobstruent. Indic.: Burning ulcers.[30]	Paste.[30]
12.	*Tīn Samaghī*,[30] *Tīn Sāmiā*, *Terra Sāmiā* [15]	Samian clay	Refrigerant, roughening, astringent, detergent, analgesic. Indic.: Vascular keratitis, stomachache.[30]	Powder.[30]

excipients.[7] Some of clays were used as cardio tonic or stomachic, and some of these were applied by rectal route for the treatment of intestinal wounds and bleeding.[12]

Clays in the literature of Unani medicine

Tīn is Arabic word means clay, mud or soil; in Persian it is called "*Khāk*".[11] Clay is formed due to porosity in the earthy particles and becomes harden after heat process. When all small particles get destroy. The types of clays are different due to diverse composition of earthy material.[13] All types of clays in Unani medicine are generally considered as *Bārid* and *Yābis* (cold and dry) in respect of *Mizāj* (Temperament) and pharmacologically desiccative and detergent in action. The part of clay which is heated by sun produces dryness without burning sensation. It strengthens the muscle and used in inflammation along with *Qayrūtī*. It is also used in ascites, splenomegaly, and fever.[14] In Unani system of medicine *Tīn or Gil* are described under different name and with specific features [Table 1, 2]. In Unani classical texts clays are described in accordance to color; *Tīn Abyaz* (white clay), *Tīn Ahmar* (red clay) *Tīn Akhdar* (green clay), *Tīn Azraq* (blue clay) or place of origin *Tīn Undulusī, Tīn Khurāsānī*, or according to its specific effect like, *Tīn Hāar* (hot clay), *Tīn Qaymūliyā* (*Terra cimolia*).[10]

Table 2: Other clays mentioned in Unani classical texts and their medicinal Indications.

Sl. No.	Common/Unani Name	Temper-ament	Pharmacological Actions	Dosage forms	Indications
1.	*Tīn Iqrītas* [15,30] *Aqarqartūn Qaritūn* [22]	Hot Dry[30]	Detergent[30], fetal protective, easing of delivery.[22]	Paste	Injury of eyes.[30] Abortion Painting.[22]
2.	*Tīn Undulusī* [30]	Hot Dry[30]	Resolvent, used externally only.[30]	Paste,[30] liniment[22]	Swelling.[22,30]
4.	*Tīn Dāghistānī* [30]	Cold Dry 2[nd°] [30]	*Muqawwi*, cardio-tonic exhilarant, detoxificant, haemostatic.[30]	Powder	Palpitation, syncope, morbid humour poisoning[30] epidemic fever due to morbid humour.[22]
5.	*TīnDāqūqī* [30]	----	Desiccant, hemostyptic, Anti-diarrhea,[22] roughning, astringent, detergent.[30]	Powder, paste	Diarrhea, resolvent to acute and compound swellings.[22,30]
6.	*Tīn al-Asfar, Gil Zard Tīn al-sanam* [30]	Cold Dry[30]	Astringent, haemostatic, resolvent.[30]	Paste[30] dusting powder[22]	Bleeding gums, haemoptysis[30] bleeding from internal organ, hemorrhage and wet ulcers.[22]
7.	*Tīn Sabz* [30] *Tīn Akhdar* [22]	Cold Dry[30]	Cardio-tonic, relaxant, desiccant, sedative, detergent.[30]	Paste[30]	Palpitation, filth of hairs and head.[22]
8.	*Tīn Sūfī Hamīd* [30]	Cold Dry 2[nd °]	Antidote,[30]	Powder[30] and Oral[22]	Insect bite, snake bite.[30]
9.	*Tīn Qabrsī* [30]	Cold Dry[30]	Astringent, antidote in poisoning,[30] anti-hemorrhagic, resolve swelling.[22]	Paste,enema and oral[22]	Dysentery, *Dhūsantāriya Kabidīwa Mi'wī* (blood with loose stool due to liver or intestine)[30] intestinal ulcer, liver abscess[22] fractures, burn.[37]
10.	*Tīn Rānā* [30]	Cold Dry I	Purgative, wound healer, antidote.[30]	3-7 g.[30]	Peptic ulcer.[30]
11.	*Tīn Qārītī* [41]	Hot Dry I [°]	Detergent without irritation, produce weakness in hawas,[41] hanging prevent abortion.[41]	Paste[30]	*Quroohchashm* (eye ulcers), *tasheel wiladat* (ease of delivery).[41]
12.	*Sugandā Mittī* [43]	Cold Dry I [°]	Absorbent, cooling, desiccant.[43]	Paste[43]	Non-healing ulcer, boils, headache.[43]
13.	*Tīn al-ārd al mazrūa*[15]	Cold Dry I [°]	Astringent, cooling, mildly laxative.[15]	Paste[30]	Ulcers wound.[15]
14	*Tīn Abyad* [22]	Cold Dry	Detergent, resolvent, cicatrizant, sedative for acute swelling.	Paste and dusting powder	Chronic ulcers, boils, acute swelling, filth of hairs and head.[22]
15	*Tīn al-Julūd* [22]	Hot Dry	Resolvent, anti-diarrheal, strong astringent.	Paste.	Swelling, diarrhea, oral intake is prohibited due to bad quality.[22]
16	*Tīn Fārsī* [22] *Gil Shīrazī Gil Sarsoyi*	Cold and Dry	Sedative for pulmonary pain	Orally and paste	Lung / chest pain[22]

Ancient Egyptians scholars used clays for anti-inflammatory actions. Ancient Greeks scholars have been used mud topically for their antiseptic properties or as cure for snake bites and antidote.[12] According to Dioscorides (40-90 CE) all kinds of clays that are therapeutically used are generally astringent, softening, cooling and agglutinant.[15] Galen (129-210 CE) also explained the pharmacological effects of clays.[12] In the medieval period especially in 10th century CE, the use of chemicals and minerals reached its peak in the Arabic world and the Arabic scientists differentiated various therapeutic qualities of clays depending on their nature and indicating the origins, their physical characteristics were described: colour, touch, smell and reaction to water.[16]

Abū Rayḥān al-Bīrūnī (973-1050 CE) listed total eight categories of clay in his book '*Al-Saydanā fī al-Tib* (pharmacy in medicine). *Ibn al-Bayṭār* (1197-1248 CE) listed total nine categories of clay with very distinct therapeutic qualities of each in his book "*Kitāb al-Jāmiʿ li-Mufradāt al-Adviāwa-l-Aghdhiā* (Compendium on Simple Medicaments and Foods), some categories of clays had been known since the time of Dioscorides (40-90 CE) whereas others were discovered by the Arab physicians.[17]

Hunayn Ibn Isḥāq al-ʿIbādī (*Iohannitius*804-877 CE) also mentioned clay formulations for the treatment of eye diseases in the form of ointments in 10th chapter of his book "*Kitāb al-Ashrāal-Māqālāt fī al-Ayn al-mansūb li Hunayn Ibn Isḥāq*" (The book of the ten treatises on the eye). He used *Tīn Shāmūs* (clay of Samos) for bandage of eyes to produce cooling and strengthening effect resulting drainage of eyes; it also used to provide adequate density of ointment.[16]

Abū Bakr Muhammad ibn Zakariyyā al-Rāzī (Rhazes, 865-925 CE) wrote special text on clay of Nishbur (*Tīn Nishābūri*), a town in the region of Khurasan in eastern Iran. Arabic title of the text is "*Fi ān li al-Tīn al-Mutanaqqal bīhī mānāfi*".[18] *Rāzī* also referred to clay in his famous book "*Kitāb al-Mansūrī*" and insisted that it should be administered carefully. He mentioned adverse effects of clays in the form of intestinal obstruction if administration was inappropriate. He specified the *Tīn Mākūl* (edible clay) could cause occlusion of hepatic channels and can also create serious indigestion, whereas the same clay can strengthen the cardia (upper opening of the stomach).[19] In Unani system of medicine; clays were also included in compound formulations. Clay is often used as a vector to transport an active product to the organ that is suffering from hemorrhage. In the case of lungs or throat treatments, clay should be accompanied by aromatic herbs. *Rāzī* proposed in his book "*Kitāb al-Judrī wal al-hasbā*" (Book on Smallpox and Measles) that clay was a drug of choice used in health care system. He mentioned an ointment containing *Tīn Armanī* (clay from Armenia) for treatment of wounds. *Rāzī* emphasized that clay which especially obtained from Armenia for anti-diarrheal effect.[17] This book was published in Arabic then Latin in 1766.[20]

Ibn Sīnā (Avicenna 980-1037 CE) described 12 types of clays his book "*al-Qānūn fī al-Tib*" (Canon of Medicine) in the chapter dealing with simple drugs. These are: *Tīn al ārd al mūzrūa, Tīn Armanī, Tīn Aqrītūsh, Tīn bilād al Māstagī, Tīn Samain, Tīn Shāmūs, Tīn Qaymūliyā, Tīnal-Kārā, Tīn Makūl, Tīn Makhtūm, Tīn Mutlaq, Tīn al Mūgharrah*.[21] Avicenna described *Tīn Qaymūliyā* (Terra sigillata) as anti-poisonous.[17] *Abul Qasim Khalaf ibn al-Abbas al-Zahrawi* (Abulcasis, 936-1013 CE) had listed some medicinal clay in his book "Kitāb al-Tasrīf" (in XXI of these 30 Volumes) and mentioned their stomatological applications. He used clay in toothpastes to give consistency to the toothpaste formula and also used for strengthening gums, polishing teeth, cleansing the mouth and preventing halitosis / pyorrhea and tooth decay.[21]

The description of various clays in Unani medicine is as follows

Tīn Mutlaq/Gil Mutlaq (Common Clay)

It is also called *'Khāk'* in Persian and *'Mitti'* in Hindi language.[22] The main constituent of common clay and shale are illite and chlorite. Illite is also a constituent of ball clays. Illite component closely resembles micas, but it has less substitution of aluminium for silicon and/or partial replacement of potassium ions between the unit layers by other cations, such as hydrogen, calcium and magnesium.[23,24]

The finest quality of common clay is which sediment below running potable water. The clay of Egyptian rivers was considered as a best quality among all the clays of rivers. It is cold in first and dry in second degree in respect of its temperament,[17] its action is desiccant, astringent, detergent, obstruent, anti-diarrheal, febrifuge and used to tone up the flaccid organ.[22] It does not cause any irritation because of its agglutinant nature. This property is exhibited only when the clay is free from burnt substances such as pieces of earthenware and chips of hot walls exposed to the sun. It is painted along with the earth procured from a sunny land on the bodies of patients of dropsy and splenitis. The effect is more evident in case of ansarca.[15] All clays are desiccative in nature and each clay act as *badal* (therapeutic interchange) for the other.[25]

Tīn Armanī/Gil Armanī (Armenian bole/Bole Armeniac/Bolus *Armenia rubra*)

It is also called *'hamād ramnā'* in Syriac, belat arītūn' in Greek and *'falā-ārmibā'* in Roman language.[22] It is a well-known clay,[26] of natural origin,[27,28] claimed to be imported from Armenia,[21] and Iran,[22,30] characteristically it is soft,[31] driest,[32] reddish brown,[14] bluish,[27,31] or blackish,[29] or dusty red in colour. They are excellent and plenty in the West Indian mines and particularly in the rich mountain of Potosi. Pedanius Dioscorides (40-90 AD) calls *la Rubrica synopica*.[33] It is sticky on tongue. The best quality of *Gil Armanī* is which is pure, clear from pebbles, sticky on tongue[34] and golden in colour.[22] Usually it is used by jewelers to impart colour

to gold.[15] It is composed of phyllosilicate minerals and a certain amount of iron oxide. It is tasteless with pleasant odour when put in the mouth stick to the tongue.[21,27] It is easily friable like lime; the powder of this clay is very ductile and soft in nature.[32] It is cold in the first and dry in the second degree in temperament.[14,15,25] It is drug of choice for haemoptysis,[35] and highly desiccant,[15] haemostatic,[14] astringent, antiseptic,[30] resolvent, analgesic and[29] and heal green wounds.[33] Some other pharmacological actions are also mentioned; like exhilarant, cardio tonic, antipyretic and mucilaginous effect.[27,31] It is used in plague and fatal disease and in epistaxis, peptic ulcers, diarrhea, non-healing ulcers,[24] infusion of this clay is very effective in asthma and corrhyza.[14] It checks bleeding from stomach, uterus, intestine and Hemorrhoids.[30] It is useful in Stomatitis, lung abscess, fever and breathlessness. It is also very effective as an anti-diarrhial on oral intake, it is resolvent of swellings in a paste form and desiccant for wet and chronic ulcers and fractures in the form of dusting powder. In case of endemic or pandemic like condition it is used internally as a prophylaxis along with *Arqe Gulāb* (Rose water) and vinegar, and apply externally as a paste on swellings.[22] It is also beneficial in fracture as a paste with *aqāqiya* (dry extract of *Acacia arabica* (Lam.) Willd.)[34,36] It is mentioned beneficial and indicated in viral fever.[37] The therapeutic dose of this clay is 1.75-7 gm.[22]

Tīn Makhtūm (Terra sigillata)

It also known as *Gil Makhtūm, Maghrah kāhenā*,[14] *Maghrah mulayyinah, Mughrag Yamānī and Tīn al-Kahinīn*.[37] A pomet kind of white bole sometime little reddish moistened in water and afterward formed into little cake, it is stamped and different seal are found on it accordingly. This clay is available with some impression (seal), and imported from *Buhayra* (island of lemnos).[17,35] It is so called *Būhaīra* because it has a smooth surface and is devoid of grass and rocks.[15] It is also called *Tīnkāhenā* because it was discovered by a *Kāhenā* (Fortune teller) lady[28] named '*Artamīs*.[34] The best quality of this clay that is red in outer and inner layers, sticky on tongue, smell as dill seed (soya) and act as hemostatic as dusting powder.[22] It is available in the form of quadrangular tablet.[28] According to *Abū Rayhān Muhammad ibn Ahmad al-Bīrūnī* (973-1050 AD) commonly known as *al-Bīrūnī* in his book '*Kitāb al-Saidanah*' *Gil makhtūm* is called '*Musafrajis*' in Roman and '*Nabashta*' in Persian language. Galen call this clay '*Maghra Limnia*'.[37] The best sealing clay should have an odour like that of dill. It acts as astringent clay. In the name of clay of lennos, *Terra sigillita, Terra lamnia*, is famous and is like sealed clay also called as Lemnian Earth. It is very red, and much like red ocher or red lead. It has a distinguish feature that it will not colour the finger on touching.[33] It is dry soft and friable some time yellowish, white or reddish. Sealed clay are soft to touch with clayey touch to the tongue and are sometime tinged or coloured with turmeric or other drugs, Turk masters in making it and used as antidote,[38] against poisons, hemorrhages, gonorrhea, and vomiting, dysenteries, hemorrhage etc.[39] Chemically it is peroxide of iron and calcium carbonate.[27] It is used as a dusting powder for treating oozing wounds and skin diseases.[40] Tempermentally it is considered moderate in comparison to hot and cold,[32] according to other Unani scholar cold and dry in second degree.[27]

It is considered Cardio tonic, glutinous, desiccative, astringent, haemostatic, antidote, antiviral,[27] cicatrizant.[29] It is used in *ishāle damwī* (bleeding diarrhea),[41] pro healer inulcers,[42] tubercular ulcer, gut ulcer, haemoptysis[31] *Ibn Sīnā* (Avicenna 980-1037 CE) has mentioned it as potent haemostatic[30] and beneficial in pandemic as Khesanda (Infusion).[37] *Hakīm Alī Gīlānī* (d. 1609) says it has cardio tonic effect and exhilarant along with rose water, and also useful in viral infection especially plague,[30] According to Galen (129-210 CE) it is beneficial against poisons of *Arnab Bahrī* (sea rabbit) and *Zarārīh* (Canthradium), and in dog and snake bite.[35] It is a rare antidote against any kind of poison.[33] Especially with fresh milk it prevent from toxicities of all type of poisons.[36] Powder and infusion are used in epidemic diseases.[32] All clays have haemostatic property but *Tīn Makhtūm* has *Mushil* (purgative)property especially for poisons.[22]

Gil Multānī (Solum fullonum)

Chemically It is silicate of alumina (Fuller's earth). In *Khazaīnul Advia* by *Hakīm Najmul Ghanī* (1859-1899 CE) mentioned under the heading of *Tīn Khurāsānī*,[30] *Ibn Sīnā* (Avicenna 980-1037 CE) has mentioned in the heading of *Tīn Makūl* (edible clay).[35] It is white mucilaginous, hard and pleasant clay having good taste,[30] Physically white and bluish,[26] or light in colour, and sticky in nature.[42] This multi-layer clay is commonly used for washing head.[27,31] It is considered cold and dry temperament,[27,30,31] in second degree.[28] Therapeutically it acts as haemostatic, astringent, detergent, sedative,[27,29,31] stomachic, obstruent, and resolvent. *In Ilājul Amrāz* by *Hakīm Sharīf Khān*, it is mentioned that in India *Tīn Nishāpūrī* is considered same as *Tīn Multānī*.[30] But according to *Makhzanul Advia* by *Hakīm Mohammad Husayn bin Hādī Alī Aqīlī Shīrāzī* that *Gil Multānī* and *Tīn Khurāsānī* are totally different. *Gil Multānī* has mix layer of white, yellow and red. It is hot and dry in temperament.[22] According to Yusuf harawi *Gil Multānī* is *Tīn Fārsī* that is also called *Gil Shīrazī* and *Gil Sarsoyi*. It is useful in *Waram Damwī* (Acute inflammation).[36]

Tīn Nishābūrī (Clay of Neyshabur)

It is also called *Tīn Mākūl* (Edible clay), *Tīn al-Akl* and *Tīn Khurāsānī*. It is white in colour, fragrant and tasty with some alkalinity. After roasting its alkalinity is reduced. It is eaten both in roasted and unroasted form. Some use it for writing on plaque. It is cold and dry in temperament (*Mizaj*),[22] some scholar said it is hot in nature due to its alkalinity.[37] It acts as stomachic especially tone up '*Fam-e-meda*' (Orifice of the stomach), it acts as anti-vomiting, anti-salivation, anti-coryza and anti-diarrheal agent. It is also used as a fragrance agent due to its good smell.[22] It prevents from syncope and removes the phlegmatic matters from stomach and beneficial in (*Jū 'al-Kalb*) Canine appetite.[37]

The therapeutic dose is 4.5-13.5gm. The excessive dose leads obstruction in liver, hepatic insufficiency and stone formation.[22] According to *Ibn Jazla Baghdādī* to use external only is a better option due to its toxicity.[34]

Gerū (Red clay / Ochre)

It is called *'Mailatūs'* and *'Bartiqun'* in Greek,[37] *'Tīn Ahmar'* and *'Tīn al-Maghrah'* in Arabic, *'Gil Surkh'* and *'Tīn Fārsī'* in Persian and *'Gerū'* in Hindi language.[22] It is a silicate of Alumina and oxide of Iron. Characterized by well-known deep red colour dust imported from red clay of different states,[26] it is a native white aluminum silicate found in Ceylon. It is obtained by purifying native white feldspar or aluminum silicate by elutriation which removes silica and feldspar. It is thus converted into a soft, friable, whitish earthy mass.[43] The best variety is considered of Baghdad,[15] or Gwalior. It is red and bluish in colour and soft in nature: It is of two types; first is pure which is bright red in colour named is *Saūn Gerū.*[27] It has cold and dry temperament in second degree.[27,31,42] It has more astringent and desiccant properties.[15] Second one is less red named only *'Gerū'*. Some Unani scholar stated *'Gerū'* is better than *'Tīn Makhtūm'*.[22] It is cold and dry[44] in second degree.[22] different Unani scholars described diverse actions like glutinous, haemostatic, astringent, derivative,[27,42] anthelmintic,[41] antiseptic, mucilaginous,[28] used in case of piles, intestinal and bladder ulcer it is useful along with plantain water and with sugar, acts as a general tonic, it soothes the facial skin along with Sesame oil.[42] It is also used in hemorrhage, menorrhagia, *habbul qara* (a type of intestinal worms) and high temperature. As a liniment it is used in *buthūr* (eruptions), *qurūh* (wounds), *jurūh* (ulcers). It is useful with vinegar in *jamra* (carbuncle), baras (vitiligo), *namla* (herpes), and *warme hār* (acute swelling). The therapeutic dose is up to 7 g. Intake more than therapeutic dose may act as obstruent.[22]

Tīn Qaymūliyā/ Gil Qaymūliyā (Terra cimolia)

It is also called *'Hajar rukhām'*[36,44] and *KharyāMittī*,[29,35] *Chiknī mittī.*[43] It is mainly imported from Afghanistan, Turkey and Iran.[28] It is of three type; one is white, shiny and fragrant as camphor, second is blue which is mucilaginous and felt cold and its soluble in water is delayed. It is transported from *Bilad Andalus* (Spain) and *Arman* (Armenia) and these both types are commonly used for medicinal purpose. The third type is black in colour and transported from *Andalus* (Spain), it is bad in quality among all three types.[22] The best is that which is most greasy and very cold in one's hands.[33] According to Galen it is a *Murakkabul Quwā* (having compound temperament) drug because of cooling and resolvent property.[37] It is shining white like marble. It has camphor taste.[14] It is well known white colour mucilaginous clay available in the form of crystals also used for writing on the slates.[28] It is considered cold and dry in second degree,[28,29] and others have mentioned it as cold in second and hot in first degree in temprament.[15]

It acts as hemostatic, desiccant, absorbent and antidiarrhoeal.[28,29] Its paste along with vinegar is useful in *warm e Aslul uzn*, (parotitis) and other inflammation, antidote for *Arnab Bahrī* (Sea rabbit) poison and blistering by canthradium,[38] and useful in all kind of swelling in the body. It softens the testicular hardness[15] and in case of burn it will keep away the flesh from blistering.[33] It is beneficial in burns and prevents ulcer formation after burn and heals non healing ulcers, it is beneficial in deep seeded gastritis and all type of inflammatory condition with vinegar.[34,36] Another type of *Tīn Qaymūliyā* is *Tīn Hurr* which is also called *'Khāk durust'* in Persian language, some Unani scholar includes this *Tīn Hurr* in *Tīn Undulusī and Tīn fārsī* and some include in *Tīn al-Kharātīn and Tīn Qaymūliyā*. Narcotic addicts eat this clay due to its fragrance and taste.[22]

Tīn Shāmūs (Calcium Carbonate)

It is called '*Tīn Shāmīs*', '*Tīn Shāmis*' *'Kawkab al-ard', Kawkab Shāmūs*,[22]*'Gil Shami*' and '*Tīn al-Kawakib*'.[37] It is also called '*Chashmā Shāmūs,* in Syriac, '*Falāghā Samis*' in Roman, *'Abu Barītas'* in Greek and *'Gil Safayd'* in Persian language.[22] It obtained from island of Samos, so it is called *Tīn Shāmūs*.[17] It is of three types: first is white clean and shiny with multiple layers; second is earthy layer, friable and easily dissolve in water, this type is also called *'Usturā'(Kawkab)* in Greek, *'Abrak' in*persian and *'Kharī Mittī*' in Hindi language;[22] and third type is white clean, friable, sticky on tongue and light in weight easily dissolve in water. Last one is better, bur according to Dāūd Ankātkī second one is better which imported from *Qabris* also spelled *Kibris* (Turkish Republic of Northern Cyprus) and *Siqaliya* (Island of Sisli, one of the districts of Istanbul, Turkey).[22] According to Galen (129-210 CE) the third type is used in Unani medicine called *Kawkab Shāmūs*,[14] that especially used in haemoptysis,[38] it acts as hemostyptic.[34] It is considered of cold and dry temperament in second degree. Its indications are anti-phlegmatic, antibilious, cholegogue, usefull in burns and piles.[40] It has more stickiness and mucilaginous property as compared to *Tīn Makhtūm*, it has more sedative effect although less cooling property.[35] There is no need for washing of this clay.[34] It is used in mastitis[25] and reduces the sweating either by applying externally or internally, it is particularly useful in initial stage of inflammation. In case of sepsis and non-healing ulcer it is used along with vinegar and fresh ulcer heals rapidly,[30] also especially used as quick healing agent in intestinal ulcer. It is beneficial in flaccid organ like breast, groin, external auris and axillary region. It is used in acute swelling like gout with Roghan Gul and in *Dhūsantāriya* (blood with loose stool) with Bartang (*Plantago major* L.)[22] and in poisons and insect bite with alcohol.[37] According to Galen (129-210 AD), *Tīn Shāmūs* resembles to *Tīn Makhtūm* in respect of its haemostatic property. It is more adhesive and viscid than *Tīn Makhtūm* and stronger in action.[15]

Tīn Rūmī (Romanian clay)

It is slightly red or bluish white, or pink colour clay having good smell.[14,22] On rubbing the hand becomes red and when put on the tongue it becomes shiny, it is considered cold and dry in temperament. It produces roughness and astringency; with endive water it dissolves the swelling of eyelid. It is used in enema in case of dysentery and peptic ulcer.[30] It has desiccant and astringent property, so claimed to be very effective in hematemesis and diarrhea.[14] It acts as resolvent with *Arq kasni* for swelling of eyelids and prevent hemorrhage from eyes.[22,34]

Tīn Mīsrī/Gil Mīsrī (Egyptian clay)

It is called as *'Artuyās'* (Plowed earth for cultivation) in Greek language. It is imported from Egypt. It is ferine clay, viscid in nature and whitish in colour. The best quality of this clay is which is earthy in colour and friable. After purification as a *Ghasle Safeda* it becomes more friable.[22] Charactestically it has a lining externally bitter in taste. It very effective in its actions. Temperamentally it is hot in first degree and dry in second degree. It acts as a detergent, astringent, and roughening agent prevent hemorrhagic diarrhea, and very effective in anasarca.[30] It is also used in splenitis, chronic swelling,[30] pitting oedema and ascites.[22] Its paste along with vinegar or alone is very effective in chronic piles[30,32] and in chronic pain.[37]

Tīn al Kārā/Tīn al-karmī(Syrian clay)

In Unani Medicine, it is called *Asālitūs* found in Syria.[30] It is of black colour clay resembling coal.[35] and similar to a rectangular piece of coal of cedar wood.[30] It keep safe from any incident, so is called *Tīn al-karm* due to its generosity.[22] It is cold and dry in temperament.[30] It is roughening, resolvent in lesser degree, and produces astringency, According to Pedanius Dioscorides (40-90 CE) it has laxative effect also.[14,30] It is desiccant[34] but may cause irritation. It is mixed with coryllum which promotes growth of hair on eye lashes and also used as a hair dye.[15,32] It is lethal for the worms and when taken orally it kills various types of worms including intestinal worms.[15] However, the white and dusty colored variety is not easily soluble in water, so it is considered inferior in quality.[30] It is used in internal and external hemorrhage, boils, chronic ulcers, melasma and itching.[22]

Tīn Mastagī / Gil Mastagī (Mastic clay)

It is also called *Tīn bilād al-Mastagī, Tīn al-Jazīr al-Mastagī,Tīn al-Kayus*,[22] *Tīn Hayā* and *Tīn Habūsh*.[37] It is obtained from where mastic is grown; best clay variety thought which is white in colour, soft in nature, heavy in weight, and easily dissolves in water. Its *Mizāj* (Temperament) is considered hot and dry in second degree. It is the only clay that has de-obstruent property. It is also absorbent, when applied on the face it becomes shiny. According to *Ibn Sīnā* (Avicenna 980-1037 CE) it has irrigating property.[30] It is mentioned as detergent, irrigator and pro-healer.[14,35] It act as concoctive and healing agent for burn and used for face glowing and cleansing agent.[22] It is indicated for hair growth[34] and burn like conditions.[37]

Tīn Sāmiyan (Samian clay)

It has its origin from the island of Samos in the East Aegean, used in antiquity as an eye salve and for the cleaning of cloth. Previously.[45] The clay of Samia is light white and stick to one's tongue if you touch on it. It is brittle and yet will melt. There is another type of it called Aster, which is close and hard as a stone. Both type of Samian clay is excellent antidote against poison or the biting of serpents.[33] Samian clay has been equated with kaolin but its composition is probably more closely associated with the local borates to be found in the proximity of bentonitic clays. Microbiological testing of hydrated layered silicates (Kaolin and Bentonite) from Samos and Melos in the Aegean in association with different borates (colemanite, tincalconite) was carried out against common pathogens, like *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Results of the study revealed that even a few hundred ppm of boron / boric acid in the Samos Bentonitic clays can have a significant effect on the reduction of bacterial colonies. This observation validates the assumption that the medicinal properties of the clays were integrally associated with the mineralogy of specific localities within the volcanic islands of their origin [Tables 1 and 2].[46]

The Melian Earth/clay

It is of an ash-colour like Eritrian; but it feels rough, and makes a noise between the fingers like a Pomice stone. It has the virtue of Alum, but very weak and it will make the tongue something dry. It cleanses the body, give a good complexion, and will cure the itch.[33]

THERAPEUTIC CLAYS, CURRENT PERSPECTIVE

Clays come in many colors, and can even be used as natural colorants for soaps and lotions. Certain clays are used as an important ingredient in foot and after-bath powders as well as in cosmetics. These clays come from volcanic ash. There are three main groups of clays: Montmorillonite clays, Illite clays, and Kaolinite clays. Montmorillonite clays have strong drawing properties and are exceptional for removing oils, toxins, and impurities from the skin. These are part of the smectite group, which means they absorb. They clear and cleanse the pores and help clear acne.[23] Montmorillonite was reported as a carrier for the oral formulation of an anti-cancer drug (5-flouracil).[11] Montmorillonite and Bentonite are known as detoxifying agents. The significant ion exchange capacities of clays allow adsorption of harmful elements such as heavy metals, ammonium and histamine.[47]

Mite clays get their coloring from the natural clay micas. Mites are not part of the smectite group. These clays are light and fluffy compared to the other clay groups. Certain clays in the illite

group are said to be antibacterial; green illite clay is one of them. This group is used to cleanse and gently exfoliate the skin.[23]

Kaolinite clays are used to stimulate blood circulation, exfoliate, and cleanse and nourish the skin. The Kaolinite group is not part of the smectite group. These clays are widely used in cosmetics and many personal care products as well as in industrial manufacturing.[48] Kaolin or china clay are a mixture of different minerals. Its main component is Kaolinite; in addition to it contains quartz, mica, feldspar, illite, and montmorillonite frequently. Kaolinite is made up of tiny sheets of triclinic crystals with pseudohexagonal morphology. It is formed by rock weathering. The contemporary use of clays for the treatment of hyperacidity of stomach was kaopectate, which contains Kaolinite as its active component. The mechanism of action is explained by the interaction of Kaolinite with gastric acid and surface adsorption of H^+. The large surface area and high adsorption capacity of this composition give it the power to adsorb toxins.[49] Another research showed that white clays, which are used today in pharmaceuticals and cosmetics, are kaolin-based and mainly composed of crystallized Kaolinite, different amounts of quartz, and illite or micas. The same study also revealed that the chemical composition of green clays contained Bentonites having smectites and small amounts of Kaolinite, illite and trace amounts of quartz. Research has shown that *Tīn Akhdar* (green clays), known as French clays, have satisfactory anti-bacterial and wound healing properties. Pink, orange and red colours of clays are often formed by the presence of iron oxides in them. It is known that these clays also have antibacterial properties. Black clays have exerted anti-inflammatory and cosmetic properties. Clays have been also used as permeability enhancers in topical traditional formulations. They have also been studied in sustained release formulations to prolong the release of active constituent.[12] Clays are generally used in face packs and as an important cosmetic ingredient in various cosmetic formulations beside several other therapeutic utilization.

White Kaolin Clay (Kaolinite Group)

White Kaolin or China clay is used in mineral makeup foundations, fillers, and blushes. This clay is light and very mild, and it does not absorb or draw oils. In facial masks, it's used for its gentle exfoliating, its ability to remove toxins, and it's cleansing of the skin and pores. This clay is the best choice for those with sensitive skin.[48]

Pink, Red, Black, and Yellow Kaolin Clay (Kaolinite Group)

All these clays have the same characteristics as the white kaolin clay. They gently remove dead skin cells and toxins and restore and nourish the skin. The clays get their colors from clay micas. They're often used as natural colorants in soap-making. These clays are all very mild and great for sensitive skin.[48]

Kaolin may be used in variety of cosmetics, such as foundations, makeup bases, eyeshadows, blushers, mascaras, powders and face powders. Kaolinite group of clay mineral is made up of one layer of silica and one layer of alumina, its chemical formula is $Al_2O_3.2SiO_2.2H_2O$ (39% Al_2O_3, 46.5% SiO_2 and 14.0% H_2O) Beside cosmetic utility several other reported medicinal activity / uses are, for example Kaopectate (kaolin-pectin) are the main ingredients in the original formulation of anti-diarrhea medication in pharmaceutical applications. Kaolinite is good local and gastrointestinal adsorbent that can adsorb lipids, proteins, viruses and bacteria, can be used to cause platelet aggregation and to start plasma coagulation by activating factor XII.[50]

Bentonite Clay (Montmorillonite and Smectite Groups)

Bentonite is light gray clay best used for oily skin. It draws out oils and toxins and exfoliates the skin. Many soap-makers add Bentonite clay to their shaving soaps for the extra slip the razor needs for gliding while shaving. This clay is made of volcanic ash. Do not use Bentonite in a facial more than twice a week because it can draw out too much oil, leaving your skin dry.[48] Bentonite has been used externally on skin since antiquity. Reported activity reveals that Quaternium-18 bentonite lotion and cream is reported effective in allergic contact dermatitis and other forms of dermatitis. Bentonite could act as a physical protective substance on skin. In sunscreens, it has been reported inclusion of montmorillonites have optimized functional properties such as water resistance and skin adherence, and bentonite mineral in sun lotion is potent in absorbing the UV light. Bentonite is also shown action in healing of skin lesions and ulcers, as an antidiarrheal, irritable bowel syndrome, increases gut flora activity, may be beneficial in renal health, Antibacterial (modified montmorillonites), immunomodulator, Montmorillonite as a drug delivery system for cancer therapy drugs, decrease the bleeding and clotting time (hemostatic agent). Big doses of bentonite can display some Adverse effects, hypokalemia is reported in one case which might be due to the gastrointestinal binding of essential electrolytes, in view of these findings, therapeutic dose should be maintained.[51]

Bentonite is a rock formed of highly colloidal and plastic clays composed mainly of montmorillonite, a clay mineral of the smectite group, and is produced by *in situ* devitrification of volcanic ash. In addition to Montmorillonite, Bentonite may contain feldspar, cristobalite, and crystalline quartz. One of the special properties of Bentonite are ability to form thixotrophic gels with water, ability to absorb large quantities of water, and a high cation exchange capacity. The properties of Bentonite are derived from the crystal structure of the smectite group (which is an octahedral alumina sheet between two tetrahedral silica sheets). Variations in interstitial water and exchangeable cations in the interlayer space affect the properties of Bentonite and thus to the commercial uses of the different types of Bentonites. By

extension, the term Bentonite is applied commercially to any clay with similar properties. Fuller's clay is often a Bentonite.[15,23,48]

Fuller's earth (Multani matti) is used as an absorbent clay for its absorbent property, formerly used for removing grease and dirt from woolen goods, a process known as fulling', it possesses the property of clarifying oils from animals, vegetables, minerals and some other liquids. Its dehydrated samples adhere strongly to the tongue. Used as poultice for skin eruptions and also substitute for talcum powder,[52] Used in Paraquat poisoning,[53] it can be used to decontaminate skin after nerve agent and other exposure, used for centuries for absorbing dirt's and oils,[54] beneficial for drawing out skin toxins and promoting tissue repair. Used with Sulphur to treat oily skins.[55] fuller's earth, is a mixture of a range of clays from the smectite group, including the species montmorillonite, $Na0.33Al1.67Mg0.33Si_4O_{10}(OH)_2$.[53]

They are varying in colour to yellow, yellowish brown, buff, and greenish grey or light grey. Fuller's earth, is generally grey-green powder of hydrated https://www.sciencedirect.com/topics/nursing-and-health-professions/aluminum-silicatealuminium silicate and aluminium magnesium sulphate.[55] Containing small proportion of lime, magnesia, alkalies and iron oxide. It generally contains a high proportion of water and can be upto 30%, chemical analysis of a commercially available Ionised Green Clay reveled silica 44.5%, water 25%, aluminium 13.5%, calcium 5.5%, iron 4%, carbon 3.5%, magnesium oxide 2%, potassium 1%, phosphorus 0.37%, sulphur 0.15%, sodium 0.04%, manganese 0.03%, zinc 0.03%, chlorine 0.01% and others constituents 0.37%.[53]

Clays are sub-divided into certain genetic types. They are: Peat mires: Medicinal peat mires consist mainly of decayed organic substances and the vegetative residues of swamps. There are small amounts of mineral substances in peats. In highly acidic peat mineralization may reach 250g/L or more.[1] Sapropels: Sapropels, which are silt deposits, are mainly of organic composition with a small admixture of mineral substances, forming, for the most part, in freshwater reservoirs as a result of the microbiological disintegration of algae and other vegetative, as well as animal remnants. According to the species composition of organic remnants and the nature of their mineral substances, sapropels are subdivided into algae and zoogenic, humus and peat, clayey and lime sediments.[1] Sulphide silt sludges: According to sulphide contents, these sludges are subdivided into weak-sulphide, and strong-sulphide-muds, in the mineralization of their mud solutions they are distinguished as low-medium- and highly mineralized muds. In accordance with the conditions of their formation, sulphide-muds are distinguished as lake and spring, continental, seashore, and marine silts. Sulphide silt sludges, sapropels, and peats are most widely used in mud therapy. About 500 deposits of therapeutic muds have been studies in varying degrees in the USSR, a fact reflected in 'Catalogue of therapeutic mud deposits in the USSR (1968).[1] Clayey slurries: Clayey slurries are thinly-dispersed mineral sediments of reservoirs with a small content of organic substances.[1] Volcanic muds: Volcanic muds are semi liquid clayey formations created in the process of rock disintegration. They are characterized by 10-20 g/L mineralization of their mud solution. Volcanic muds often contain increased concentrations of bromine, iodine and boron.[1]

RATIONALE FOR THERAPEUTIC CLAYS

Peat therapeutics and Balneotherapy is natural ancient therapeutics. Organic peat includes mud preparation and peloid used in Balneotherapy also contain lake or sea mud and plant substances, they are applied either locally or over whole body. The characteristics of specific peat mud constituent used are important. It changes regulation and reactive functions causing improvement of capacity, adaptations and self-healing. Muds pack therapy with other therapy work together for treatment of diseases such as psoriasis. The degree to which this effect is pronounced depends not only on the functional state of the patient, but on the physico-chemical properties of different types of muds.[56]

The thermal effects of various types of therapeutics muds on the organism are not same. The heat conduction of mud is determined by the chemical substance contained in it, by the ratio of organic and inorganic compounds, and so on. Under the influence of the thermal factor, more or less intensive dilatation of vessels is observed at the place of mud application, depending on mud temperature, as well as acceleration of blood flow in them, temperature rise in surrounding tissues, normalization of permeability, and acceleration of metabolic process. In heating muds of different compositions to the same temperature, the effect is different, which depends on pH and degree of their mineralization. Muds with a higher mineralization and sharp acidic index are conducive to a more pronounced normalization of excitability of neuro muscular apparatus and skin thermos receptors. The mechanical factor in mud therapy is not as important as that in mineral baths treatment. But it should be taken into account both in external applications and in the treatment of internal organs. The layer of mud is used in skin applications and in the treatment of internal organs. The layer of mud in skin applications should be no less than 4-5 cm thick, and up to 400 g of mud may be used for vaginal and rectal mud packs. It is claimed that a fair pressure on the underlying tissues is conductive to spreading heat in them to a greater depth.[56]

The chemical effect in the use of medicinal muds is determined by their component organic and inorganic compounds and biologically active substances, trace elements, etc. The nature of physiological reactions developing in mud therapy to a great extent depends on the compositions of muds. Thus, in an experiment aimed at the comparative study of the effect of sulphide silt and peat mires, it was found that procedures with

sulphide sludge stimulated the functions of the medullary layer of the adrenals while peat mires depressed them.[57]

Inorganic chemical components of the muds are mainly absorbed by the skin, stimulating the skin receptors and vessels. Particles of organic substances (Humic acid, amine bases, hydrogen sulphide, nitric substances etc.) penetrate the inner medium of the body through undamaged skin and may influence directly organs and tissues. An important role in the healing effects of muds is played by their biologically active organic substances, such as enzymes, vitamins, mediator type substances like histamine, acetylcholine, as well as hormone like substances like folliculin and other oestrogenic hormones. The morphological changes that take place under the effect of mud therapy are most manifest in the cells of the skin. The reaction of acidic peat (pH 1.8) taken from the Sapozhkovsky deposits, causes thinning of the horny and clears layers, and thickening of the granular layer of the skin [58] Vacuolization of the cells of the growth layer also occur. Changes in dermis take place resembling inflammatory infiltration: there is an increase in the number of lymphocytes, histocyte and eosinophils. Various component of mud, such as iron, appear among cells of the dermis.[56]

Among the organic components of medicinal muds antioxidants have been found which are capable of regulating enzymatic process in tissue, and cellular metabolism. Mud therapy enhances the activity of many enzymes (catalase oxidase and cholinesterase, etc.). The antioxidant effect of mud therapy explains the positive influence this treatment exerts on tissues regeneration. The course of mud therapy normalizes the immunological reactivity of the organism, reduces the susceptibility to allergy, and brings the indices of non-specific immunity back to normal. The most obvious effect of mud therapy is observed in its action on local inflammatory process by causing hyperaemia of the tissues, improving trophics and functions of blood circulation, coarse mud application promotes the resolution of the pathological products of inflammation. The mud therapy augments the defensive and adaptive potential of the organism, activates the hypothalamo, hypophysial adrenal system, and stimulates the functions of sympathico-adrenal system. Just as under the influence of balneo-procedures, mud therapy increases the number of functioning capillaries, the release of blood from depots, accelerates the blood flow and boosts the volume the blood circulating in the body.[58] The natural parameters as the magnitude of atmospheric pressure, the intensity of electric magnetic fields, radio activity, wind velocity, humidity, and character of solar radiation, quantity and ratio of positive and negative ions of air, aerosols of air saturated with marine salts, etc., contribute to the effect produced by climatic factors on the therapeutic effect of clays. They may prove to be natural stimulants of the human body under the influence of various physiological regulatory mechanisms evolved, the above findings need research evidence for evaluating these therapeutic clays and develop it as a natural therapy with sound rationale.[1]

CONCLUSION

Medicinal clays are used in Unani System of medicine since antiquity. Most of the Unani/ Greeko-arab scholars mentioned their therapeutic actions and its utilizations in Unani classical and Traditional medicine texts. In view of rational explanation of the medicinal effects of these clays, it is important to propagate and study these effects for use in humans for benefits that seem to be cost effective and a natural remedy for various diseases and also as a Cosmeceuticals and Cosmetics. These traditional literatures and resources from Greco-Arab medicine could open new windows for further drug discoveries in respect of clays.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

ZH: Zulfeqar Haidar, **Indic.:** Indication.

REFERENCES

1. T˜Sarfis PG. Nature and health: Treatment and rehabilitation by natural factors. Mir Publishers. 1985;50(8)4:98-102.
2. Harth R. Attacking MRSA with metals from antibacterial clays. ASU now [press release]. Arizona State University. Retrieved 20 -09-2017.
3. George GS. How clay works: Science and applications of clays and clay-like minerals in health and beauty. Galina St George. 2021.
4. Magner LN, Chapter 4. Greco-Roman MedicineTaylor and In: A history of medicine. 2nd ed. Francis Group. 2005:129.
5. Carretero MI. Clay minerals and their beneficial effects upon human health. A review. Appl Clay Sci. 2002;21(3-4):155-63. doi: 10.1016/S0169-1317(01)00085-0.
6. Magner LN, Chapter 2. Medicine in ancient civilizations. In: A history of medicine. 2nd ed. Taylor and Francis Group, LLC. 2005:45.
7. History and benefits of clay [cited 22/9/2022]. Available from: https://enviromedica.com/blogs/learn/history-and-benefits-of-clay.
8. Bergaya F, Theng BKG, Lagaly G. Handbook of clay science. Dev Clay Sci. 2006;I(11):117-25.
9. Duffin CJ, Moody RTJ, Gardner-Thorpe C, editors. A history of geology and medicine. Geological Society, London. Special Publications. 2013:375.
10. Khan MA, Azam M. Urdu translation. New Delhi: CCRUM. 2012;2:29-63.
11. Rodrigues LA, Figueiras A, Veiga F, De Freitas RM, Nunes LC, Da Silva Filho EC, *et al*. The systems containing clays and clay minerals from modified drug release: A review. Colloids Surf B Biointerfaces. 2013;103:642-51. doi: 10.1016/j.colsurfb.2012.10.068, PMID 23253474.
12. Hosseinkhani A, Montaseri H, Hosamo A, Zarshenas MM. An evidence-based review on medicinal value of clays in traditional Persian medicine. Curr Drug Discov Technol. 2017;14(1):2-7. doi: 10.2174/1570163813666161007160036, PMID 27748171.
13. Tazkera Ulil Albab AD. New Delhi: Central council for research in Unani Medicine (CCRUM); 2007:438-40.
14. Baghdadi AIH, Fi al-Tib KM. Urdu translation. New Delhi: CCRUM. 2005;2:157-61.
15. Sina I. Al-Qanoon fi al-Tibb (English translation). New Delhi: Jamia Hamdard. 1998;1i:311-6.
16. Lev E. Lev E. Healing with minerals and inorganic substances: A review of Levantine practice from the Middle Ages to the present. Int Geol Rev. 2010;52(7-8):700-25. doi: 10.1080/00206811003679661.

17. Rautureau M, Figueiredo Gomes CD, Liewig N, Katouzian-Safadi M. Historical aspects of a natural pharmacopeia: Clay in the corpus of the medieval pharmacopeia written in Arabic. In: Clays and health. Berlin: Springer. 2017;33-46.
18. Mohaghegh M. Razi and his book on Al-Tin Al-Nishaburi. Med J Islamic Repub Iran (MJIRI). 1992;6(1):39-41.
19. Razi AMZ. Kitab-Al-Mansuri [Urdu translation by CCRUM]. New Delhi: CCRUM. 1991:123.
20. Kaadan AN. Al Raz's book on smallpox and measles. Qatar Med J. 2000;2000(2):7. doi: 10.5339/qmj.2000.2.7.
21. Carrasco J, Liñán M. The stomatological use of stones cited in the Kitab al-tasrif treatise (Abulcasis, 1000 CE). London: Geological Society. Special Publications. 2013;375(1):65-80.
22. Makhzanul HM, Advia. (Urdu Translation by Hakim Nur Karim). Darushifa Matba Masihayi Munshi Nawal Kishore. Kanpur. 1765;2:13-8.
23. Adamis Z, Williams RB, Fodor J. Bentonite, kaolin, and selected clay minerals. World health organization. 2005.
24. Johns T. The chemical ecology of human ingestive behaviors. Annu Rev Anthropol. 1999;28(1):27-50. doi: 10.1146/annurev.anthro.28.1.27.
25. Al-Maghribi ASBI. Kitab al-Fatah fi al-tadawa Min Jamie Sunufil Amraz Wa al-Shakawa [Urdu translation by Hakim Abdul Bari]. 1st ed. New Delhi: National Capital Planning Commission Printers. 2007:124-5.
26. Anonymous, Sarkari Q. Govt of India. 2nd ed. New Delhi: CCRUM; 2006:117-22.
27. Mustehasan AA. Advia ma'Dania. New Delhi: Ejaz publication house; 2004:86-96.
28. Kanzul RM, Advia. AMU: University publication division. 1985:576-81.
29. Abdul Haleem HM, Azizi M. New Delhi: CCRUM; 2009:37.
30. Khazainul GN. Advia, Matba Munshi Nawal Kishore. Lucknow. 1926:1127-33.
31. Makhzanul Mufradat KM. New Delhi: idara Kitabus Shifa. 2007;348(353):360.
32. Baitar I. Al-Jamiul Ii-Mufradat al-Adviawa al-Aghzia. (Urdu Translation). New Delhi: CCRUM; 2003;3:236-50.
33. Barba AA. A collection of scarce and valuable treatises upon metals, mines and minerals. C. Tephson. 1669.
34. Jazla YBI. Minhajul Bayan Fi Taqweem al-Abdan. Tehran: Digital Library Ghaemiyeh. 1972:232.
35. Al-Qanoon SI. Fi al-tib (Urdu translation by Ghulam Kantoori). New Delhi. Idara Kitabus Shifa; 2007;2:243-55.
36. Yusufi YBM. Riyaz al-Advia. Tehran: Digital Library Ghaemiyeh. 1972:156.
37. Husain AB. IKhtiyarat-e-Badi. Tehran: Digital Library Ghaemiyeh. 1972:664.
38. Rāzī A, Al-Hawi K. Part j (Urdu Translation by CCRUM). 2007;XX1:98-105.
39. Pomet M. Lemery M and Tournefort. On Earth: A Complete History of Drugs (written in French), Book VI. eGoogle book. London; 1570:185-90.
40. Vohra SB, Athar M. Mineral drugs used in Ayurvedic and Una ni medicine. Narosa Publishing House; 2008:25.
41. Ibne RAWM, Kulliyat K. Ist. Ed. New Delhi. CCRUM. 1987:309-11.
42. Hakeem AHM. Bustanul Mufradat: New Delhi. Idara Kitabus Shifa. 2002:486-8.
43. Nadkarni KM. Indian materia medica. Mumbai: Popular Prakashan Private Limited; 2009:6-10.
44. Harawi MAMA. Al-Ibnia an Haqaiq al-Advia. Tehran: Digital Library Ghaemiyeh; 1972:146.
45. Photos-Jones E, Keane C, Jones AX, Stamatakis M, Robertson P, Hall AJ, *et al*. Testing Dioscorides' medicinal clays for their antibacterial properties: The case of Samian Earth. J Archaeol Sci. 2015;57:257-67. doi: 10.1016/j.jas.2015.01.020.
46. Laufer B. Geophagy. Publications of the Field Museum of Natural History. Anthropological Series. 1930;18(2):99-198.
47. Karaman R. Novel modified bentonite-montmorillonite and activated charcoal complexes for detoxification. Int J Clin Toxicol. 2014;2(2):37-41.
48. Sally W, Trew Zonella B, Gould. The complete idiots guide to Making of Natural products. Alpha Publications, Penguin group; 2010:47-51.
49. Ghadiri M, Chrzanowski W, Rohanizadeh R. Biomedical applications of cationic clay minerals. RSC Adv. 2015;5(37):29467-81. doi: 10.1039/C4RA16945J.
50. Akisanmi P. Classification of clay minerals. In: London: Intech Open; 2022. Mineralogy [internet] René M, editor [cited Nov 13 2022]. Available from: https://www.intechopen.com/chapters/81885doi. doi: 10.5772/intechopen.103841.
51. Moosavi M. Bentonite clay as a natural remedy: A brief review. Iran J Public Health. 2017;46(9):1176-83. PMID 29026782, PMCID PMC5632318.
52. Anonymous. The wealth of India – A dictionary of Indian raw materials and industrial products. Vol. IV: FG. Publication and information directorate. New Delhi: Council of Scientific and Industrial Research. 2005:65-8.
53. Limpitlaw UG. Ingestion of Earth materials for health by humans and animals. Int Geol Rev. 2010;52(7-8):726-44. doi: 10.1080/00206811003679695.
54. Fuller's earth – medical countermeasures database. Countermeasure_ fullersearth. htm. Available from: https://chemm. Available from: http://hhs.gov/, [accessed on 13/11/2022].
55. Clarke S, editor. Essential chemistry for aromatherapy. Elsevier Health Sciences. 2009.
56. Mark D, Groven ND. Peat therapeutics and balneotherapy. In: Pizzorno JE, Murray MT, editors. Text book of natural medicine. Elsevier. 2006:385-92.
57. Zolnikova AI, Eremenko FI, Nevstrueva VS. Soldatov VV. on effects of pelloids with different physicochemical properties on the body. Transactions of the institute of physiotherapy and spa treatment. Moscow. 1968;12:74-7.
58. Soldatov VV. Morphologic alterations in the skin of rabbits in experimental atherosclerosis and during sodium chloride bath treatment. Proceedings of the 2nd all union conf. exp resort med phys therm Yalta, Oct 14-16: Moscow. 1969;1070:203-6.

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