

## ISTORIJA MEDICINE

### HISTORY OF MEDICINE

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#### BURNS TREATMENT IN ANCIENT TIMES

##### LEČENJE OPEKOTINA U DREVNA VREMENA

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#### Summary

Discovery of fire at the dawn of prehistoric time brought not only the benefits to human beings offering the light and heat, but also misfortune due to burns; and that was the beginning of burns treatment. Egyptian doctors made medicines from plants, animal products and minerals, which they combined with magic and religious procedures. The earliest records described burns dressings with milk from mothers of male babies. Goddess Isis was called upon to help. Some remedies and procedures proved so successful that their application continued for centuries. The Edwin Smith papyrus (1500 BC) mentioned the treatment of burns with honey and grease. Ebers Papyrus (1500 BC) contains descriptions of application of mud, excrement, oil and plant extracts. They also used honey, Aloe and tannic acid to heal burns. Ancient Egyptians did not know about microorganisms but they knew that honey, moldy bread and copper salts could prevent infections from dirt in burns healing. Thyme, opium and belladonna were used for pain relief. In the 4<sup>th</sup> century BC, Hippocrates recorded that Greek and Roman doctors used rendered pig fat, resin and bitumen to treat burns. Mixture of honey and bran, or lotion of wine and myrrh were used by Celsus. Honey was also known in Ayurveda (Indian medicine) time. Ayurvedic records Characa and Sushruta included honey in their dressing aids to purify sores and promote the healing. Burn treatment in Chinese medicine was traditional. It was a compilation of philosophy, knowledge and herbal medicine. The successful treatment of burns started in recent time and it has been made possible by better knowledge of the pathophysiology of thermal injuries and their consequences, medical technology advances and improved surgical techniques.

**Key words:** Burns + therapy; History, Ancient; History of Medicine; Honey; Ceremonial Behavior

#### Sažetak

Otkriće vatre u praskozorju praistorije pružilo je tadašnjem čovekolikom stvorenju koristi od svetla i toplote i istovremeno označilo početak lečenja opekotina koje su se zadesno dešavale. U Starom Egiptu doktori su pripremali lekove od biljaka, derivata životinja ili minerala ali su svi postupci bili praćeni magijskim ili nekim religioznim postupcima. Najraniji podaci o lečenju opekotina opisuju lečenje mlekom majke koja je rodila muško dete. Boginja Isis je pri tome moljena za pomoć. Neki lekovi i postupci su imali toliko zadovoljavajućih rezultata da su se koristili vekovima. U papirusu Edvina Smita (1 500 pre nove ere) spominje se lečenje opekotina medom i mašću. Ebersov papirus (datira iz istog perioda) sadrži opise o primeni blata, izlučevina, ulja i biljnih ekstrakta. Takođe se koristio med, aloja i taninska kiselina u lečenju opekotina. Stari Egipćani nisu znali za mikroorganizme ali su znali da med, plesniv hleb ili bakarni prah mogu sprečiti zagađenje opekotina. Za smanjenje bola koristili su majčinu dušicu, opijum i beladonu. U grčkoj i rimskoj medicini stavljanje zavoja natopljenog svinjskom mašću, smolama i bitumenom korišćeno je prema zapisima Hipokrata iz 4. veka pre nove ere. Mešavima meda i mekinja, kao i tečni rastvor izmira u vinu koristio je još Celzus. Med je bio poznat u ajurvedsko vreme indijske medicine. Ajurvedski zapisi Čarake i Susrute uključuju medom natopljene zavoje kao pomoć za čišćenje gnojavih rana i ubrzanje zarašćivanja. Lečenje opekotina u kineskoj medicini bilo je tradicionalističko. To je bila kompilacija filozofije, nauke i herbalne medicine. Zadovoljavajuće lečenje opekotina je počelo tek u novije vreme. Tome je doprinelo poznavanje patofiziologije povreda izazvanih toplotom i njihovih posledica, savremena medicinska tehnologija i napredak hirurške tehnike.

**KLjučne reči:** Opekotine + terapija; Drevna istorija; Istorija medicine; Med; Obredi

#### Introduction

One of the turning points in the history of mankind was the discovery of fire, which resulted in many good points. However, negative effects produced by fire and high temperature left reminders of

the injuries to the early men –burns. Skin injuries caused by fire, which could be of various degrees, always resulted in some complications, whether minor or major ones, or even death. The prehistoric men, who lived in nomadic tribes, were exposed to all forms of trauma. Since nobody had knowledge or

any ideas how to treat those injuries, some individuals began to help in such situations with prayers, spells and various forms of magic, thus standing out from the crowd of the “equals” [1].

Fire caused accidental trauma in external environments (the invaders burned villages, there were spontaneous forest fires) or in dwellings (hearths in huts and houses during food preparation, or other domestic manufacturing processes). Red-hot metal was used to punish enemies by blinding them or to burn wounds inflicted by venomous animals. With the development of medicine, fire became a method of cauterization to stop bleeding and was usually applied in the limb amputations [2].

Treatment of burns started as folk medicine, however, there are no written records about it. Having gained basic knowledge about plants and their effects (vegetable oil, apples, onion, leaves of various plants), animal products (honey, milk, fat, butter, eggs) [3], minerals and various chemicals (copper, malachite, etc.), men started to use them.

Experience gained over centuries showed that treatment of burns required local application of fats and oils, special coatings, removal of decay products, anti-infection therapy, as well as rehydration and alleviation or elimination of pain [4]. All experience and knowledge about helping the injured and the sick was conveyed orally up to the time of invention of writing.

The beginning of human civilization is considered to have started in the valley of two great rivers the Tigris and the Euphrates. The witnesses of that time are the numerous clay tablets with the data on the treatment of illness and injuries found in the library of Asurbanipal in Nineveh (Assyria), preserved now in British museum in London, and deciphered [5]. The practice of the “doctors” was to perform physical examination, make a diagnosis and prognosis, and recommend remedies. Application of creams, dressings and bandages to treat injuries and burns was a part of everyday life in those times.

## Egypt

According to an Ancient Egyptian legend about the origin of the world, the goddess Isis treated burns of her son Horus [6] by nursing him (**Figure 1**). This story influenced the treatment of burns for many centuries.

Medicine in Ancient Egypt began to develop in the temples where highly educated people, who were priests – wound healers - doctors – surgeons at the same time, learned and taught the science of diseases and trauma, and where they recorded their own observations, successes or failures. From the first dynasty of kings 3000 BC, many institutions were set up to treat the sick and injured, and to study medicine. Prayers to gods and magic rituals accompanied medical treatment regularly. Long time before 2500 BC, burns were treated with milk of mothers who had male children. Treatment was



**Fig. 1.** Goddess Isis nursing Horus  
*Slika 1. Boginja Isis doji Horusa*

accompanied by prayers to goddess Isis [7]. According to Herodotus’ records, Egyptian doctors-priests often focused and specialized in certain fields of medicine and disease [8], but there are no data on physicians dedicated to burns treatment.

Invention of writing enabled the doctors of Ancient Egypt to write their observations down on papyrus scrolls, some of which are available now and having been deciphered, they revealed some of that ancient knowledge and experience [9]. The Smith papyrus, known by the name of its discoverer and owner Edwin Smith, was written around 1500 BC and it is considered to be one of the oldest records on medical treatment.

It is believed that the original data come from the period 3000 BC [10,11]. Today, the papyrus scroll is the property of the Academy of Medicine in New York, and it is exhibited in the Room of Rare Books. This 5-meter-long papyrus is mostly devoted to surgical problems and treatment; it contains descriptions of 48 injuries on the body as well as recommendations on the treatment of burns by packs of honey [12].



**Fig. 2.** Egyptian medical text: Georg Ebers papyrus  
*Slika 2. Egipatski medicinski tekst: Ebersov papirus*

Another papyrus, known as Ebers papyrus after its first owner George Ebers, belongs now to the University Library in Leipzig. It contains many guidelines for surgical intervention [13,14] (**Figure 2**). One of the tips is "... if the wound is bleeding (from blood vessel) it must be burnt with fire." It was treated with a knife heated in the fire. Cauterization as a method of stopping bleeding and wound treating has remained for next 4000 years up to the present [2].

Burns and scalds were very frequent in households during food preparation. The Ebers papyrus contains an important section (paragraph 482-509) with the title "Beginning of the remedies for a burn" (paragraphs 482-509). It begins with suggestions for a series of different remedies to be applied as follows:

- day 1 - black mud (perhaps to cool the burn for a short time and relieve the pain)
- day 2 - excrement of small cattle (sheep, etc) (not logical because the excrement increases the risk of serious infection)
- day 3 - resin of acacia, barley dough, carob (it is a beanlike Mediterranean plant), oil (for its soothing effect)
- day 4 - wax, oil, cooked unwritten papyrus
- day 5 - carob, red ochre, part of ima (today unknown name) tree, copper flakes (clean the burns)

This recipe, if translation from hieroglyphics is correct, seems completely illogical nowadays. Besides, there are no recorded results of this treatment.

Cooling of burned areas is described in paragraph 484 of papyrus, but it is not stated whether this refers to the initial or subsequent cooling medicated dressings. There are also records of recipes, but without

specific sequence of ingredients by days of application, such as:

- honey was used in several recipes to reduce swelling and because of its antibacterial effect
- paragraph 491 mentions the application of copper flakes and malachite (antibacterial effect !)
- oil was an integral part of most recipes
- some recipes contained some plants not recognized for their positive effect on burns treatment or animal excreta (skepticism of today may not be entirely justified),
- in the last paragraph (509) it is written: "Mix barley bread, oil/grease and salt into one and apply this mixture until the patient feels well. This works - I have often seen it happen."

The Ebers papyrus also contains two magical rituals that had to accompany the treatment prescribed [15].

Paragraph 491 of the Ebers papyrus suggested malachite powder to be used for dressing in soiled and infected burns [16]. Later, copper carbonate and hydroxide as the main ingredients of malachite, proved as inhibitor of proliferation of *Staphylococcus aureus* and *Pseudomonas aeruginosa* [17].

The papyrus Hearst (Hearst Medical Papyrus) is a collection of medical prescriptions, which is owned by Hearst Museum of the University Library in California. According to the Hearst prescriptions 34 and 90, 95 and 249, translated by Walter Wreszinkom in 1912, tannic acid, obtained from the seeds and fruits of Acacia herb, was used to treat burns [18-20].

Although they did not know anything about microorganisms that caused infection, the Egyptians used antiseptics in the treatment of wounds and burns to prevent complications. Dressing of willow leaf wraps reduced the possibility of infection, as well as honey, moldy bread, and wraps with garlic [7,21]. Solutions of copper salts and wine were used for antiseptics. According to the papyrus Ipsinger [22], cedar oil was used as an antiseptic.

Patients with burns were in a lot of pain and upset, and since Egyptian doctors knew about analgesic and sedative agents, they gave the patients drugs with opium and belladonna. If a person was injured and bleeding heavily, red-hot metal was applied to the burn to stop bleeding [21].

Honey was used for wound dressing as a natural antibiotic [23,24] and it proved to be effective in the treatment of burns. Today we know that honey reduces swelling by its osmotic effect, and the bacteria do not grow in honey [23]. Aloe Vera was also used for the treatment of burns [23].

## Greece

In Greece, the practice of medicine, as a treatment of diseases and injuries by trained people, began about 1000 BC. Asclepius was mentioned in the 8th century BC as the first recorded doctor who was both adored and deified. He and his son Machaon were mentioned in the Iliad poem as doctors and

wound healers. Later, many temples were built in the name of god Asclepius throughout Greece and they were actually organized sanatoriums. In the epic poem the Iliad, which is said to have been written by Homer, the injured soldiers were trained by a doctor in military camps to help themselves and to offer the first aid to the others [2]. The Greek doctors were taught medicine at medical schools organized within healing temples of Asclepius at Epidaurus, Pergamum, Kos, Knidos and elsewhere. In the 4<sup>th</sup> century BC, a medical school, which was in the range of university, was established in Alexandria, and henceforward, medical knowledge and experience was transferred from Egyptian doctors to Greek doctors,

The most famous Greek doctor is Hippocrates from the island of Kos (the period 460-360 BC). According to his writings, burns were treated by dressings impregnated with pork fat, resin and bitumen [25]. Local therapy of burns by applying slices of lemon (citric acid as an antiseptic), various oil formulations and blends of tea leaves (tannic acid as an antiseptic) was in practice in the time of Hippocrates around 430 BC. Grease or pig's fat were often used in the preparation of drugs [26].

### Roman times

The Romans studied medicine mainly from conquered people: Egyptians, Etruscans, Persians, and mostly, from Greeks. Before the arrival of doctors from Greece, medicine in Rome was empirical and magical, and then medicine became more and more scientific. Since many wars were waged in that time, military hospitals were places where all injuries, particularly war wounds, were treated.

In the ancient Rome, burns were treated by the mixture of honey and bran as recommended by Aulus Cornelius Celsus [25] as well as by wine and lotion from Izmir [19]. Galen (129-199 AD) is said to have introduced cold water in burns treatment although there is no written evidence in his papers [19].

Medicine in Rome was responsible for establishing and organization of medical schools, public and military hospitals, and systems for clean water supply [21].

### India, China and the East Asian Countries

Ayurveda, a part of Vedic system in medicine that promotes health as harmony of body, soul and spirit, appeared in India around 3000 BC. Some written documents described the beneficial effect of honey known in East Asian countries for centuries. Ayurveda (sometimes translated as a science of life) is the ancient Indian medicine. Ayurvedic documents describe honey as the nectar of life and recommend it to be used in a variety of diseases (**Figure 3**). Charaka and Sushruta, preachers of Ayurvedic Science, used honey to dress wounds and burns [12,27].

The records of Traditional Chinese Medicine, which was based mostly on empirical observation, give two recipes for the local treatment of burns



**Fig. 3.** Indian medical text: a manuscript of the Atharva veda

**Slika 3.** *Ajurvedski medicinski zapis: rukopis iz Atarva vede*

known in the ancient times: one suggested dressings with a mixture of vegetable oils, and the other one contained mature forms of sponges from the family *calcareo Sulphurica* or lard boiled with willow bark. Bandages impregnated with this mixture reduced the possibility of infection of wounds successfully [28].

### Ancient civilizations of the American continent

For centuries, extensive burns were bandaged or left untreated so that the organism itself had to fight with deformed scars and such burns often resulted in death. There are only scarce data on the application of red-hot metals, usually knives, to stop bleeding after amputations or other surgical interventions. People of the central and southern American continent knew about the analgesic and anesthetic effects of the plant *Coco*, but there are no surviving records that it was applied for that purpose [29].

### Conclusion

The overall knowledge of burns originating from old medicine of the Babylonians, Etruscans, Egyptians, Greeks, Romans and other peoples of Asia, Africa and America was rather modest but applicable. The new history has brought additional forms of burns that appeared in the medieval wars (hot oil containers were used in the defense of occupied towns) and damage from electrical current (modern era and electrocution). Successful treatment of burns started in recent time. Until the 1940s, a patient with burn covering over one third of the body would probably have died. Nowadays, modern centers are equipped to treat burns covering 65% of the body. Advances in bacteriology and pharmacology, surgery and intensive care have enabled successful treatment of severe and deep burns. A significant reduction in mortality and consequences of burns are the positive achievements of modern medicine and related sciences.

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