Aegyptus et Pannonia VIII.

Acta Symposii anno 2021

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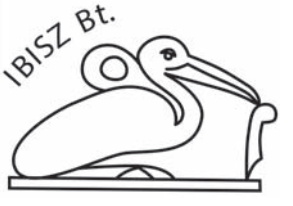

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Contents

“Plants for Health from Ancient Egypt to Present Day” Conference and the HEFS AEC

Dr. Hedvig Győry PhD
HEFT AEC president

After the realization of the 2019 mummy conference, the need arose to discuss the new trends, methodologies and achievements in ancient materia medica from a phytotherapeutic point of view and to disseminate the results achieved by our in-depth research. With this conference, we also wanted to explore how many different ways there are to approach ancient plants and medicine, also from historical, cultural, religious, ethnographic and pharmacological points of view, and to compare it with other related fields. We also wanted to draw attention to other areas of research into plants that maintain and improve health. In this way, contemporary and historical treatments were juxtaposed, Egyptian, Hittite, Greek, Roman and later European herbal medicine, to mention only the most important regions studied in these proceedings. The conference was held in two languages, English and Hungarian, but all the articles in the proceedings are English. We hope that this way we can bring these issues to the attention of as many people as possible.

This time we have chosen to discuss the plants used for health problems. A significant proportion of the substances in ancient Egyptian prescriptions are of plant origin. Reviewing and studying their effects and data can also provide new opportunities for the current pharmacopoeia. Our group of doctors thought that there was a lot of new knowledge to be gained in this area worldwide, and that the knowledge of plants is becoming increasingly important, if we only think of the research into pathogens, many of which have adapted to synthetic drugs. We need thus new materials to use to eliminate them, and earlier medical practices may lead to the discovery of new active substances that are important for people today. Knowledge of these active ingredients makes it possible to apply these drugs as new medicines in a consistent quantity and quality. On the other hand, there are also many places where conditions do not allow the use of drugs produced by modern technology, but nature can help patients with its often hidden treasures. In addition to pharmacological research, folk remedies studied by ethnomedicine

and historical medical research play an essential role in getting to know them.

The HEFS AEC partly organizes its activities in cooperation with other organizations – the above-mentioned international workshop of the Nephthys project in 2022 was co-organized by the Hungarian Natural History Museum, while this very conference took place in partnership with the HNM Semmelweis Museum of Medical History, whose members gave several lectures on historical medicine and modern ethnomedicine, and where a special chamber exhibition would have welcomed the participants in honour of the conference, if the COVID had not prevented the organization of a face-to-face meeting. Nevertheless, we were able to offer the possibility of discussions and consultations in special virtual chambers, allowing the exchange of professional experiences.

The HEFS AEC has published these new proceedings, this time in two volumes (Aegyptus et Pannonia VII-VIII), containing more than half of the papers presented at the conference: “Plants for Health from Ancient Egypt to Present Day”. As we focused on our main research topic in the Medical Research Group of the HEFC Ancient Egyptian Committee, we wondered what the scientific community thought about the ancient Egyptian use of plants in various fields of human and natural sciences, the continuity of related knowledge, and the implications and possibilities of these ancient practices for people today. We also wanted to present the ideas we had developed and the results we had achieved in the professional field, and to provide an opportunity for specialists to discuss different topics. In terms of the structure of the proceedings, we have returned to the previous method of the series, so that the articles are once again listed in alphabetical order of authors, rather than by subjects

The HEFS Ancient Egyptian Committee and the medical history

The HEFS, which has been operating since 1995, carries out several activities in the tradition of its earlier activities: the general programs focus on the last five thousand years, selecting interesting and important topics, while the work of the AEC is mainly directed in three directions. An important objective is (1) the cultural transmission and dissemination of knowledge about ancient Egyptian culture through lectures and public meetings for interested adults, also in the framework of the Hungexpo. We also organise (2) artistic and handicraft activities, workshops accompanied by discussions on various topics with children, launching every year a fine arts competition (drawing/painting), the results of which will be exhibited for the third time in January 2023 in the Deák 17 Children’s and Youth Art Gallery of the Budapest History Museum; and (3) following scientific and scholarly research into the use of ancient objects, human and animal remains – including an international event of the Nephthys Project in 2022 – and medical history, concentrated on phytotherapy and surgery.

As far as our material at the conference is concerned, we present here as a starting point our research focused primarily on the use of plants in surgery, if only because several members of the group are doctors from the Department of Surgical Research and Techniques at the Faculty of Medicine in Semmelweis University, Budapest. The first scientific results of this new direction are published of today's surgical tools and materials. Thus our conference papers focus on the ancient Egyptian surgery from the point of view of the application of plants in these volumes, but research is alsobeing carried out in other areas. Firstly we present research in the direction that is mainly focused on comparative analysis, directed towards the ancestors surgical kit, the plant materials used for wound care and the general knowledge of ancient Egyptian surgeons, with a view to the surgical culture of other peoples and periods or the use of pharmacognostic knowledge. We have also considered it essential to investigate into possible reasons for the use of plants, which may allow us to consider modern phytotherapeutic applications.

Two other areas of our phytotherapy research are also represented in these volumes. The origin and treatment of various diseases throughout the world, and especially in ancient Egypt, is also an interesting topic. In this direction, we have chosen to focus one disease in particular. Diabetes is one of the most widespread diseases of our time, and we have chosen to study its ancient treatment methods. In this case, as in the case of surgery, we have compared several cultures to find out the ancient knowledge and problem-solving methods, and have pointed out herbs that are officially used in the world, or in Hungary.

Another problem of our time, seemingly far removed from the history of medicine, is the conservation and preservation of biodiversity, which is affected not only by climate change and other natural factors, but also by human activity. This phenomenon can be traced back even to ancient Egypt, although the process has accelerated in the last hundred years. One of our topics in this respect is presented here, showing how an ancient curiosity herb has become a plant of large-scale production in the 21st century, and saving this way the species from extinction.

A new direction of the group is the study of the history of Hungarian phytotherapy in partnership with the Semmelweis Museum for Medical History. We have just taken the first steps in this direction, but we can already say that the classical Roman authors, and the ancient Egyptian knowledge they transmitted also played an important role in official medical practice and influenced folk medicine in our country. It seems that the herbaria published in Hungarian language played a key role in this process.

The interweaving of contemporary and historical issues characterizes many of the articles in the volumes. At the same time, mutual influences, shifts of emphasis and reinterpretations within the ancient world, or elements of later historical periods that reach into the past or present, play a prominent role. In this field, it is essential to collect and examine the sources from a new perspective in order to obtain a clearer picture of certain details of the past. Historical, artistic, literary, religious, economic, museological, pharmaceutical, phytotherapeutic, ethnobotanical or even chemical points of view appear in individual articles. It has been proven that the ingredients listed in many of the ancient Egyptian recipes studied so far can still be used as effective medicines today.

This volume contains 16 contributions on the role of drug use in different periods. There are chapters on the reconstruction of some ancient Egyptian remedies, on the ancient method prescribed for the preparation of antjw ointment, or on the preparation and action of kyphi, and pelargonium, traced through biochemical and experimental research; Others are devoted to the materia medica used in Hungary over the centuries, or to the comparison of contemporary Egyptian folk medicine and pharaonic materia medica in the field of gynaecology; another is devoted to studies on the possible identification of magical Egyptian plant names with a dominant connection to the moon, or to the ritual and non-ritual use of some plant substances with religious names in Egypt. Others relate to the popular treatment of diseases such as tuberculosis and cholera in Hungary, or which edible plants have been identified in Coptic medical therapies. Sedative plants are also featured in the current volume, and a plant closely associated with a butterfly is discussed. Another article focuses on the pomegranate, with its many meanings as a symbol of fertility and female power. Yet another focuses on the worldwide surgical use of plants, while others discuss the balance between practical and religious beliefs in the use of medicinal plants. The pop-up exhibition for the conference is briefly introduced, hinting at the museological aspect of medical history.

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The editors of these volumes would like to thank again all the organizations and individuals who made the conference and the publication of these volumes possible, as well as the speakers, the members of the Organizing and Scientific Committees, the secretary of the conference, and the technical assistance, i.e. all those who contributed to the realization of the conference and who have contributed with their knowledge to the these volumes. Special thanks are also due to the authors of the papers for their work and cooperation.

We would also like to express our gratitude to all those colleagues and volunteers who have shared their expertise and offered their generosity by providing scientific or linguistic proofreading for these volumes.

Thanks are also due to the active participation of Aquila Design, who coordinated and realized the editing and printing and to our financial supporters, the Hungarian Natural History Museum, the Ibisz Bt. and the Kiss Ferenc a Növényi Biodiverzitásért Alapitvány [Kiss Ferenc Plant Biodiversity Foundation], whose aim is to raise awareness of the natural treasures we have and to try to teach people to use them, rather than abuse them.

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Medicinal and Pharmaceutical Properties of the *Kyphi* (and of the Orthodox Holy Chrism): A Microbiological Approach

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Abstract

The use of aromatics and incense in divine worship and in Medicine is ancient indeed. The present work is based on a recent paper concerning the comparative study of the ancient Egyptian *kyphi* and of the Orthodox Holy Chrism (Maravelia – Filianos 2020). *Kyphi* (*kꜣpt*), a special mixture of more than 12 herbal aromatic substances, including wine and honey, was used as burning incense and medicament during a very long period in the context of the ancient Egyptian culture, as is attested in Papyrus Ebers and other sources. The aim of the present paper is to investigate the possible antimicrobial effect of pure smoke and of the *kyphi* by performing fumigation experiments on bacterial and fungal cultures in two independent laboratories. Hence, the anti-fungal and anti-microbial activity of the *kyphi* [re-produced *in vitro* by one of the authors (M.F.)] has been studied by performing fumigation experiments to cultivations of *Escherichia coli* M. (Gram-negative bacterium) and *Candida parapsilosis* L.&T. (fungus) in two separate Laboratories, independently and in different conditions. Furhtermore, cultivations of two Gram-positive cocci, *Staphylococcus aureus* R. and *Staphylococcus capitis* K.&S., were tested only in the 2nd Laboratory. Preliminary results show that the action of fumigation (pure smoke and/or *kyphi*) on selective and differential culture media has almost no effect on the growth of microorganisms. However, there is a clear direct effect of smoke (pure smoke and *kyphi*) on the microorganisms, that appears stronger with *kyphi* and mainly in 1/1000 dilutions. In addition, the experimental data of our study demonstrate that the effect of *kyphi* on yeasts is more powerful than that on bacteria. It is suggested to further proceed with

more experiments, in order to confirm the above conclusions, as well as to investigate the potentially "active" component(s) of *kyphi*, discovering the pathophysiological mechanisms through which this particular antimicrobial action of *kyphi* could be explained.

Key Words: Ancient Egyptian aromatics, herbs, *kyphi* (*k3pt*), incense, Orthodox Holy Chrism, censing, fumigations, smoke, *E. coli*, *C. parapsilosis*, *S. aureus* R., *S. capitis* K.&S., microbiology, experiments, antimicrobial action

I. Introduction

Since the most remote Antiquity humans have made the very important discovery of how to make fire and use it for light, cooking, as the main heating source and for the development of various arts (e.g.: pottery, metallurgy). Fire has also the power to liberate many fragrant and medicinal molecules from plants, especially the volatile terpenoids, as well as other substances with very strong pharmacological properties, such as alkaloids (nicotine).[1] Since the beginning of civilization humans are burning on purpose – mainly plants –, to produce smoke for many different reasons.[2] All over the World many societies use smoke for several purposes, including magico-religious and ceremonial ones. This use is related to the religious beliefs and aims to the supposed interrelation of the disease with evil spirits, including incantations, prayers and rituals used as apotropaic means, petitions for favours and protection.[3] It is not so easy to understand today why and how some societies believe that smoke could protect, remove evil influences, clean a place or a person and help against higher spiritual entities, malevolent gods, the evil eye, &c. In order to understand this approach, we must study the nature of the disease, the cause of the ailments, the philosophy about life and the medical practice adopted by societies past or present.

The use of incense is very old. Perhaps the property of the simple smoke or the smoke from incense to disinfect and remove the causes of the diseases by killing the pathogenic microbes and viruses had led humans, in relation to magico-religious beliefs, to use smoke from plants in therapeutics

1 For any chemical substance referred to in this paper, the readers are prompted to look at Merck [14]2006 (or any other more recent editions). For ancient Egypt, see in particular, Lucas [4]1989; Nicholson – Shaw [5]2009. For Chemistry in Archaeology, see e.g.: Orna 1996. For the classification of plants and botany, see the classical works: Linnæus 1735; Linnæus 1742; Linnæus 1753; Linnæus (Fil.) 1781. See finally *Botanica* [4]2004.

2 On this topic, see mainly the interesting book by Pennacchio et alii 2010.

3 For the use of incense (in divine worship and the like), see Cuthbert – Atchley 1909. For the use of incense in ancient Egypt, see Lucas 1930, 41-53; Dixon 1969, 55-65; Van-Beak 1960, 70-95; van Bergen et alii 1997, 8409-8412; Maravelia – Filianos 2020, 257-260. For the *Bible*, see De Hemmer Gudme 2022, 217-231.

and medicine. Let us not forget that smell[4] is a very special sense and recently the Nobel Prize was awarded to Linda Buck and Richard Axel for their research to discover that hundreds of genes are embedded in our DNA code for the odorant sensors located in the olfactory sensory neurons of our noses. Thus, the study of the aromatic products of smoke is complex and needs a multi-disciplinary approach.[5] First the identifications come: botanical macroscopic, microscopic, chemical with different methods as chemistry, chromatography in the context of the pharmacognosy of natural products. Then other sciences can help, such as ethnobotany, ethnopharmacology, history of medicine and pharmacy,[6] paleopathology, medicine, microbiology, forensics, palynology, history of ancient civilizations and the history of ancient commerce.[7]

In a previous paper,[8] we have thoroughly studied the ancient Egyptian *kyphi* and its ingredients, comparing them to the Orthodox Holy Chrism, after re-enacting its modern reproduction *in vitro*. Its suggested ingredients have been studied according to their geographic- or trade-origin, botanical description, chemical composition and medicinal uses. The *Holy Chrism* / *Ἅγιον Μύρον*, used in the Orthodox Church for christening newly-baptized babies (in earlier eras also for anointing Orthodox Kings), may also be used with therapeutic intent and contains more than 50 herbal substances with important medicinal and pharmaceutical properties.

The aim of the current paper is to investigate the possible antimicrobial effect of pure smoke and of the *kyphi* by performing fumigation experiments on bacterial and fungal cultures in two independent Laboratories. Hence, the anti-fungal and anti-microbial activity of the *kyphi* has been studied by performing fumigation experiments to cultivations of *Escherichia coli* M.

4 On the role of smell in the cultic practices of ancient Egyptians (centered on the worship of Amūn), see a recent interesting MA Thesis (Chardonnens 2016). On the essence and use of perfume in ancient Egypt, see Byl 2012. Cf. also Chassinat 1931, 117-167; Price 2018, 137-155.

5 See our discussion in Maravelia – Filianos 2020: *passim* (and proposed literature therein). See too Moldenke – Moldenke 1952; Hepper 1969, 66-72; Janzen *et alii* 1989; Ghazanfar 1994; Mathe et alii 2004, 277-285; Schütt et alii ^{3}2014. A general and well written book on herbs and spices, used here (see *infra*) as reference is Peter 2006. Cf. too Erhardt et alii ^{17}2002.

6 On the ancient Egyptian (and Coptic) pharmacy, see e.g.: Rahman 1939; Saber 1990, 45-70. On the ancient Egyptian (and Coptic) medicine, see Till 1951; Nunn 1996; Maravelia 2020, 273-311; Μαραβελια 2022, 195-218. For the ancient Egyptian medicines and medical texts, see von Deines – Grapow 1959; von Deines – Westendorf 1961-1962. For the ancient Egyptian plants and their classification, see Loret ^{2}1892; Loret 1949; Charpentier 1981; Germer 1985; Baum 1988; Germer 2001, 535-541; Barakat 2002; de Vartavan et alii ^{2}2010; Arakelyan et alii 2012; Vygus 2012; etc..

7 See e.g.: Groom 1981; *Negev-Incense* 2005; Incordino – Creasman 2017.

8 See Maravelia – Filianos 2020, 257-303.

(Gram-negative bacterium) and *Candida parapsilosis* L.&T. (fungus) in two separate Laboratories, independently and in different conditions. Furhtermore, cultivations of two Gram-positive cocci, *Staphylococcus aureus* R. and *Staphylococcus capitis* K.&S., were tested in the 2nd Laboratory.

II. Medico-Pharmacological Properties of the *Kyphi*-Ingredients

In addition to the properties of the ingredients presented in our main paper on the *kyphi*[9] (Picture 1), we can find other uses in reference and relation to the smoke of each burned plant, applied as fumigations or inhalations. From plants of the same species used in the *kyphi* recipes or from plants of different species but of the same *genus* we can find some examples of the action of each plant's smoke, produced during its burning[10]:

1. *Acorus calamus* L.[11]: against piles or hemorrhoids, epilepsy, hysteria, toothache, colds.

2. *Andropogon schœnanthus* L.[12]: its essential oil is used as antispasmodic, diuretic and antihistaminic, as well as for flavouring; its crude oil as insecticide.

3. *Cinnamomum zeylanicum* Nees[13]: as incense, in general against diseases, as perfume for clothes and for the house.

4. *Laurus cassia* J. Presl. = *Cinnamomum cassia* J. Presl.[14]: as incense (*Laurus nobilis* L. and other plants were used in Delphi Oracle for trance and divination).

5. *Mentha piperita* L.[15]: against mental diseases, for menthol cigarettes, to repel mosquitoes, as insecticide, for cigarettes against asthma, against tuberculosis and for other respiration ailments, as an oxytocic.

6. *Convolvulus scoparius* L.[16]: in pharmaceutical preparations (rhodium wood oil).

9 See our discussion in Maravelia – Filianos 2020, 266-283 (and the bibliography cited therein). For more on the *kyphi*, see the classical paper Loret 1887, 76-132. See also Ganszyniec 1924, 52-57; Derchain 1976, 61-65; Lüchtrath 1999, 108-109; Vadas 2020, 93-132.

10 See the already cited bibliography (*supra*), as well as: Germer 1993, 69-80; van Wyk – Wink 2004; *Botanica* 42004; Peter 2006; Kaliora – Kountouri 2012, 261-284; Sahasrabudhe et alii 2017, 1965-1981.

11 See Pennacchio et alii 2010, 35; Sharma et alii 2014, 1454-1466; Maravelia – Filianos 2020, 266. In nn 10-24, *infra*, the basic reference is our extended paper on the *kyphi* and all related references therein.

12 See 'Al-Snafi 2016, 53-61; Maravelia – Filianos 2020, 267.

13 See Pennacchio et alii 2010: 69; Rao – Gan 2014, 1-12; Maravelia – Filianos 2020, 268-269. .

14 See Pennacchio et alii 2010: 69; Rao – Gan 2014, 1-12; Maravelia – Filianos 2020, 270.

15 See Pennacchio et alii 2010, 24, 122; Akbari et alii 2015, 413-420; Maravelia – Filianos 2020, 271; cf. too Ahmed et alii 2018, 463-475.

16 See Maravelia – Filianos 2020, 272; Salehi et alii 2020, 315-328.

Picture 1. Picture of *in vitro* prepared *kyphi* (*k3pt*) by the 3rd Author (Mr Markos Filianos), used for the microbiological experiments of this paper, following the ancient recipes of the temples at Philæ and Edfū (see Loret 1887, 76-132), and its hieroglyphic name. The fragrance of this substance is particularly sweet; interestingly the smoke of *kyphi*-incense smells less pleasantly. After Maravelia – Filianos 2020, 295, Fig. 26. © Copyright by Dr Dr Alicia Maravelia and Mr Markos Filianos.

7. *Juniperus phœnicea* L.[17]: It is used to purify/air-out hospital rooms, against rheumatisms, for disinfections, against the evil eye, against asthma and for colds. Hippocrates used it against plague in Athens (430 BC). According to Avicenna, it is abortifacient. Added to tobacco it enhances flavour, it is used for cooking to give pleasant aromas. Shamans used it for ecstatic dance/trance, against evil spirits, for childbirth, against colds and headache, after illnesses, to purify the air, against Eagle sickness, to cure insanity (together with prayers).

17 See Pennacchio et alii 2010, 109; Ait–Ouazzou et alii 2012, 313-319; Maravelia – Filianos 2020, 273.

8. *Acacia farnesiana/nilotica* (L.) Wild.[18]: against diarrhea, to strengthen new born babies, to induce lactation, to promote good health for babies, against epilepsy, as a perfume, as a disinfectant, for post partum bleeding, to clean milk containers, for over-excited children, for deep and lengthy sleep, against migraines, and as insecticide.
9. *Lawsonia inermis* L.[19]: to flavour milk-gourds.
10. *Cyperus longus* L.[20]: to fumigate the body during sickness, as incense, and for treating deep wounds.
11. *Pistacia terebinthus* L.[21]: according to Avicenna, for sore eyes.
12. *Pistacia lentiscus* L.[22]: to flavour meats, as incense, for open sores, coughs, etc. Furthermore, the worldwide renowned variation of *Pistacia lentiscus* L. var. *chia*[23] (Chios mastic), exhibits anti-inflammatory, anti-diabetic and healing properties, while it is also used against gastro-intestinal disorders and as a *par excellence* mouth flavouring (Picture 2).
13 + 14. *Vitis vinifera* L. + Raisins[24]: as excipient in the *vina medicata*, against vascular and cardiac ailments, and (externally) as a mild antiseptic.
15. Honey[25]: as antiseptic and as a basis for *electuaria*.
16. *Commiphora myrrha* Engl.[26]: as incense, as antiseptic, against migraine and headache, against evil forces, to perfume the clothes, to strengthen new born babies, to clean the body, against breathing difficulties, for chest colds, for swollen glands, to purify the air, against nasal catarrh, laryngitis, bronchitis, fever, against asthma, as flavouring for foods and beverages, for religious ceremonies, and to keep snakes away.

18 See Pennacchio et alii 2010, 33; Deshmukh – Bhajipale 2018, 24-34; Maravelia – Filianos 2020, 274.

19 See Pennacchio et alii 2010, 115; Semwal et alii 2014, 80-103; Maravelia – Filianos 2020, 275.

20 See Ait–Ouazzou et alii 2012, 313-319; Maravelia – Filianos 2020, 276. Cf. too Lawal – Oyedeji 2009, 2909-2917; Tran 2014: 74-77. Cf. too Samra et alii 2013, 648-659; Aghassi et alii 2013, 382-386.

21 See Loret 1949; Pennacchio et alii 2010, 143 (*idem* for *P. lentiscus*); Maravelia – Filianos 2020, 277.

22 See Tassou – Nychas 1995, 411-420; Magiatis et alii 1999, 749-752; Maravelia – Filianos 2020, 278.

23 See Kaliora – Kountouri 2012, 261-284; HMPC 2015; Pachi et alii 2020, 112485; Maravelia – Filianos 2020, 278; Pachi et alii 2021, 418.

24 See Μανουσος – Λαδοπουλου 2003, 1-18; Murray et alii [5]2009, 577-608; Maravelia – Filianos 2020, 279-280; Vadas 2020, 93-132.

25 See Zumla – Lulat 1989, 384-385; Lafont 2017, 97-121; Maravelia – Filianos 2020, 280-281.

26 See Van–Beak 1960, 70-95; Janzen et alii 1989; Pennacchio et alii 2010, 73; Maravelia – Filianos 2020, 282-283. Cf. also Groom 1981.

According to *Papyrus Ebers*[27] the *kyphi* (*k3pt*) is:

> § 852: {98, 12} *A smoking incense made to improve the smell of the house or clothing:* {98, 13a} *dry myrrhine resin,* {98, 14a} *prt-snḏ–fruit,* {98, 15a} *incense,* {98, 16a} *Cyperus grass,* {98, 17a} *wood from the ṯi-šps-tree,* {98, 18a} *melon,* {98, 19a} *reed from Palestine,* {98, 20a} *Ynktn-mineral,* {98, 21a} *Ḏmtn-mineral,* {98, 13b} *soft part of the poplar, finely pulverize, make* {98, 14b} *a uniform mass, give it into the fire.*
>
> § 853: *Another [means] which women make for it:* {98, 15b} *Give this* (= previous) *remedy in this way to cook on honey* {98, 16b}*, mix and make into globules. Then they shall be consumed with it* {98, 17b}*. May they also make mouth-pills out of it,* {98, 18b} *to improve the smell of their mouth.*

According to Dioskoridēs[28] the *kyphi* is a perfume and the composition of a perfume welcome to the gods, used abundantly by the ancient Egyptian priests:

> {1.25.1} *<κῦφι> θυμιάματός ἐστι σκευασία κεχαρισμένη θεοῖς χρῶνται δὲ αὐτῷ κατακόρως οἱ ἐν Αἰγύπτῳ ἱερεῖς. μείγνυται δὲ καὶ ἀντιδότοις, καὶ ἀσθματικοῖς δίδοται ἐν ποτήμασι. Σκευασίαι δὲ αὐτοῦ ἐμφέρονται πλείονες, ἐν αἷς ἐστι καὶ αὕτη κυπείρου ἡμίξεστον, ἀρκευθίδος ἀδρᾶς τὸ αὐτό, σταφίδος λιπαρᾶς ἐκγεγιγαρτισμένης μνᾶς δεκαδύο, ῥητίνης ἀποκεκαθαρμένης μνᾶς πέντε, καλάμου ἀρωματίτου, ἀσπαλάθου, σχοίνου, ἑκάστου μνᾶν μίαν, σμύρνης δραχμὰς δεκαδύο, οἴνου παλαιοῦ* {1.25.2} *ξέστας ἐννέα, μέλιτος μνᾶς δύο. Ἐκγιγαρτίσας τὴν σταφίδα κόψον καὶ λέανον μετὰ τοῦ οἴνου καὶ τῆς σμύρνης καὶ τὰ ἄλλα κόψας καὶ σήσας μεῖξον τούτοις ἔασόν τε συμπιεῖν ἡμέραν μίαν·εἶτα ἑψήσας τὸ μέλι ἄχρι κολλώδους συστάσεως μεῖξον ἐπιμελῶς τὴν ῥητίνην τετηκυῖαν, εἶτα τὰ λοιπὰ συνανατρίψας ἐπιμελῶς ἀποτίθεσο εἰς ἀγγεῖον ὀστράκινον.*

According to Galēnos[29] the *kyphi* is:

> *Ἐπεὶ οὖν κύφεως ἐμνημόνευσεν ὁ Δαμοκράτης, ὃ καὶ αὐτὸς κατασκευάζεται, διὰ τοῦτο καλῶς ἐποίησε, προσγράψας αὐτοῦ τὴν κατασκευὴν, ἐφεξῆς γεγραμμένην. Τὸ κῦφι δ' οὐδέν ἐστιν οὐδὲ μῖγμ' ἁπλοῦν, οὐδ' αὐτὸ γῆ φέρει τις, οὐδ' ὀπίζεται. Αἰγύπτιοι*

27 See e.g.: Wreszinski 1913. English translation from the German translation by Marco Stuhr (see more specifically P. Ebers 852: 98,12-98,14b; P. Ebers 853: 98, 14b-98,18b). For the various terms, see Hannig [5]2009.

28 See e.g.: Wellmann 1906-1914; Gunther 1934. Cf. also Theophrastus 1644; Plinius 1936. For English translation see the annex.

29 See Galēnos, *Περὶ Ἀντιδότων* II, 2, 900-901 (e.g.: in Hopfner 1922, 783). For English translation see the annex.

δὲ τοῦτο τῶν θεῶν τισιν ἐπιθυμιῶσι σκευάσαντες, ὡς φράσω. Λευκὴν λαβόντες σταφίδα τὴν λιπαρωτάτην, αἴρουσι τὸν φλοιόν τε καὶ τὸ σπέρμ' ἅπαν. {118} *Τὴν σάρκα δ' αὐτῆς λεοτριβήσαντες καλῶς Ϸα' ἱστᾶσι δραχμὰς Ἀττικὰς δὶς δώδεκα, τερμινθίνης τε ταὐτὸ τῆς κεκαυμένης, σμύρνης τε ιβ', κινναμώμου δ', σχοίνου ιβ' καὶ κρόκου μία, βδελλίου ὄνυχας δραχ. γ', ἀσπαλάθου β', ναρδοστάχυος γ', καὶ κασίας γ' τῆς καλῆς καθαρᾶς, κυπείρου, γ' δραχμὰς, ἀρκευθίδων ἑκ τῶν μεγίστων καὶ λιπαρῶν ταύταις ἴσας, θ' δὲ καλάμου τοῦ μυρεψικοῦ δραχμὰς, μέλιτος τὸ μέτριον, παντελῶς οἴνου βραχὺ, βδέλλιον, οἶνον, σμύρναν εἰς θυΐδιον βαλόντες, εὖ τρίβουσιν ὡς μέλιτος πάχος ὑγροῦ ποιῆσαι, καὶ προσαποδόντες μέλι τὴν σταφίδα συντρίβουσιν, εἶτα λεῖα δὲ ἅπαντα καταμίξαντες ἐκ τούτου κύκλους βραχεῖς ποιοῦντες θυμιῶσι τοῖς θεοῖς.* {119} *Ῥοῦφος μὲν οὕτω δεῖν ἔφασκε σκευάσαι, ἀνὴρ ἄριστος ἐκτικός ἐν τῇ τέχνῃ. Ἔνιοι δὲ κιννάμωμον οὐ σχόντες βαλεῖν μίσγουσι ταὐτὸ καρδαμώμου σπέρματος. Χρῶνται δ' ὁμοίως τῇ πρὸ ταύτης συνθέσει. Τινὲς δὲ καὶ τοῖς ἥπαρ ἢ τὸν πνεύμονα, ἢ καί τι ἕτερον σπλάγχνον ἐξηλκωμένοις.*

According to Plutarchos[30], the *kyphi* is:

Τὸ δὲ κῦφι μεῖγμα μὲν ἑκκαίδεκα μερῶν συντιθεμένων ἐστί, μέλιτος καὶ οἴνου καὶ σταφίδος καὶ κυπέρου ῥητίνης τε καὶ σμύρνης καὶ ἀσπαλάθου καὶ σεσέλεως, ἔτι δὲ σχίνου τε καὶ ἀσφάλτου καὶ θρύου καὶ λαπάθου, πρὸς δὲ τούτοις ἀρκευθίδων ἀμφοῖν (ὧν τὴν μὲν μείζονα τὴν δ' ἐλάττονα καλοῦσι) καὶ καρδαμώμου καὶ καλάμου. Συντίθενται δ' οὐχ ὅπως ἔτυχεν, ἀλλὰ γραμμάτων ἱερῶν τοῖς μυρεψοῖς, ὅταν ταῦτα μιγνύωσιν, ἀναγιγνωσκομένων. Τὸν δ' ἀριθμόν, εἰ καὶ πάνυ δοκεῖ τετράγωνος ἀπὸ τετραγώνου καὶ μόνος ἔχων τῶν ἴσων ἰσάκις ἀριθμῶν τῷ χωρίῳ τὴν περίμετρον ἴσην ἀγαπᾶσθαι προσηκόντως, ἐλάχιστα ῥητέον εἴς γε τοῦτο συνεργεῖν, ἀλλὰ τὰ πλεῖστα τῶν συλλαμβανομένων ἀρωματικὰς ἔχοντα δυνάμεις γλυκὺ πνεῦμα καὶ χρηστὴν μεθίησιν ἀναθυμίασιν, ὑφ' ἧς ὅ τ' ἀὴρ τρεπόμενος καὶ τὸ σῶμα διὰ τῆς πνοῆς κινούμενον λείως καὶ προσηνῶς ὕπνου τε κρᾶσιν ἐπαγωγὸν ἴσχει καὶ τὰ λυπηρὰ καὶ σύντονα τῶν μεθημερινῶν φροντίδων ἄνευ μέθης οἷον ἄμματα χαλᾷ καὶ διαλύει· καὶ τὸ φανταστικὸν καὶ δεκτικὸν ὀνείρων | μόριον ὥσπερ κάτοπτρον ἀπολεαίνει καὶ ποιεῖ καθαρώτερον οὐδὲν ἧττον ἢ τὰ κρούματα τῆς λύρας, οἷς ἐχρῶντο πρὸ τῶν ὕπνων οἱ Πυθαγόρειοι, τὸ ἐμπαθὲς καὶ ἄλογον τῆς ψυχῆς ἐξεπᾴδοντες οὕτω καὶ θεραπεύοντες. Τὰ γὰρ

30 See PLUTARCHOS, *Περὶ Ἴσιδος καὶ Ὀσίριδος*: 80, 383E-384C (e.g.: DIDOT 1868, 429-469; cf. GRIFFITHS 1970). For Englsih translation see the annex.

ὀσφραντὰ πολλάκις μὲν τὴν αἴσθησιν ἀπολείπουσαν ἀνακαλεῖται, πολλάκις δὲ πάλιν ἀμβλύνει καὶ κατηρεμίζει διαχεομένων ἐν τῷ σώματι τῶν ἀναλωμάτων ὑπὸ λειότητος· ὥσπερ ἔνιοι τῶν ἰατρῶν τὸν ὕπνον ἐγγίνεσθαι λέγουσιν, ὅταν ἡ τῆς τροφῆς ἀναθυμίασις οἷον ἔρπουσα λείως περὶ τὰ σπλάγχνα καὶ ψηλαφῶσα ποιῇ τινα γαργαλισμόν. Τῷ δὲ κῦφι χρῶνται καὶ πόματι καὶ χρίματι· πινόμενον γὰρ δοκεῖ τὰ ἐντὸς καθαίρειν, χρῖμα μαλακτικόν. Ἄνευ δὲ τούτων ῥητίνη μέν ἐστιν ἔργον ἡλίου καὶ σμύρνα πρὸς τὴν εἴλην τῶν φυτῶν ἐκδακρυόντων, τῶν δὲ τὸ κῦφι συντιθέντων ἔστιν ἃ νυκτὶ χαίρει μᾶλλον, ὥσπερ ὅσα πνεύμασι ψυχροῖς καὶ σκιαῖς καὶ δρόσοις καὶ ὑγρότησι τρέφεσθαι πέφυκεν· ἐπεὶ τὸ τῆς ἡμέρας φῶς ἓν μέν ἐστι καὶ ἁπλοῦν καὶ τὸν ἥλιον ὁ Πίνδαρος ὁρᾶσθαί φησιν: "ἐρήμης δι' αἰθέρος", ὁ δὲ νυκτερινὸς ἀὴρ κρᾶμα καὶ σύμμιγμα πολλῶν γέγονε φώτων καὶ δυνάμεων οἷον σπερμάτων εἰς ἓν ἀπὸ παντὸς ἄστρου καταῤῥεόντων. Εἰκότως οὖν ἐκεῖνα μὲν ὡς ἁπλᾶ καὶ ἀφ' ἡλίου τὴν γένεσιν ἔχοντα δι' ἡμέρας, ταῦτα δ' ὡς μικτὰ καὶ παντοδαπὰ ταῖς ποιότησιν ἀρχομένης νυκτὸς ἐπιθυμιῶσι.

From the above it is evident that the abundance of natural herbal ingredients of the *kyphi* (Picture 1) and their significant medical and pharmaceutical properties could make of it an excellent preventive and healing medicine. The ingredients of *kyphi* common also in the Holy Orthodox Chrism are shown in Table I.

III. Studying the Action of Smoke from the *Kyphi*-Incense Microbiologically

The basic aim of the present study is to investigate and compare the possible antimicrobial effect of pure smoke and of the *kyphi* by performing fumigation experiments on known microorganisms (bacteria, fungi and cocci) in two independent laboratories. In our preliminary experiments (1st Laboratory) these fumigation experiments showed interesting results of the *kyphi* smoke on *Escherichia coli* M. (Gram-negative bacterium) and *Candida parapsilosis* L.&T. (fungus).

For the fumigation procedure, an improvised construction was used made of two clay containers (in which we have placed the smoking material), an iron tripod and a large Berzelius glass beaker with a liquid capacity of 5000 ml according to the arrangement depicted in Figure 1.

№	INGREDIENTS OF THE *KYPHI* [∑ = 16]	PRESENT ALSO IN THE HOLY CHRISM [∑ = 9]
1	*Acorus calamus* L.[ABC + Exodus]	+ (= *Acorus calamus* L.)
2	*Andropogon schœnanthus* L.[ABC]	+ (= *Cymbopogon s.* Spreng)
3	*Pistacia lentiscus* L.[ABC]	+ (= *Pistacia lentiscus* L. var.: *P. latifolia*)
4	*Laurus cassia* L.[ABC]	+ [= *Cinnamomum cassia* (Nees) Blume]
5	*Laurus cinnamomum* Andr.[ABC + Exodus]	+ (= *Cinnamomum zeylanicum* Nees)
6	*Mentha piperita* L.[ABC]	—
7	*Convolvulus scoparius* L.[ABC]	—
8	*Juniperus phœnicea* L.[ABC]	—
9	[*Acacia farnesiana* L.][ABC]	—
10	*Lawsonia inermis* L.[ABC]	—
11	*Cyperus longus* L.[ABC]	+ (= *Cyperus rotundus* L.)
12	Pulp of Dry Raisins[ABC]	—
13	Wine of Oasis[ABC]	+ (= *Vitis vinifera* L.)
14	Resin (of the Terebinth Plant)[ABC]	+ [= *Pinus* sp. or *Larix europæa* D.C. (Pinaceæ)]
15	Honey[ABC]	—
16	Fine Ground Myrrh[ABC + Exodus]	+ (= *Commiphora myrrha* Engl.)

Picture 2. Pistacia lentiscus L. var. chia. (c) Copyright by Dr Dr Alicia MARAVELIA.

Table I. The ingredients of *kyphi* as met in the Edfū (see e.g.: Lüchtrath 1999: 108-109) and Philæ recipes: **A** & **B**, **C**, respectively, and the nine (9) common ingredients of the Holy Chrism (**+**); those seven (7) not used in the latter are also shown (**–**). The index $^{+\ Exodus}$ shows the three ingredients that are referred to in the important passage of *Exodus* (XXX: 22-25) for the *Old Testament's* Chrism. After Maravelia – Filianos 2020: 293, Tab. 6.

Figure 1. Experimental setting for fumigating the testing plates and cultures (before and during fumigation) in the 1st Laboratory (Mr Pantelis Bolanis, MD).

III.1. Methods and Procedures

Process A. Culture on Mac Conkey Plates that have been fumigated in a semi-closed jar, for 30 minutes, and were fumigated before the inoculation with *Escherichia coli* (Figure 1). Application of suspension of *Escherichia coli* according to McFarland Standard 2 on plates with a ring stylus of 10 µl (plate № 2 on the photos) and 1 µl (plate № 6 on the photos) (Figure 2).

Process B. Culture of suspension of *Escherichia coli* on Mac Conkey Agar Plates. The inoculation was done before the fumigation (action of the smoke for 30 minutes) (plate № 1) using a stylus of 10 µl (Figure 2).

Process C. Culture of testing plate inoculation with a stylus 10 µl (plate № 3), without fumigation.

The plates № 1, № 2, № 3, № 6 were developed at a temperature of 25 °C (Figure 2).

Process D. Culture of suspension of the fungus *Candida parapsilosis* on a Sabouraud Agar Plate with a ring stylus of 10 µl and then fumigation for 30 minutes (plate № 4) (Figure 3). The same suspension as testing was applied

on another plate of the same substratum, but without smoking it (plate № 5) (Figure 3).

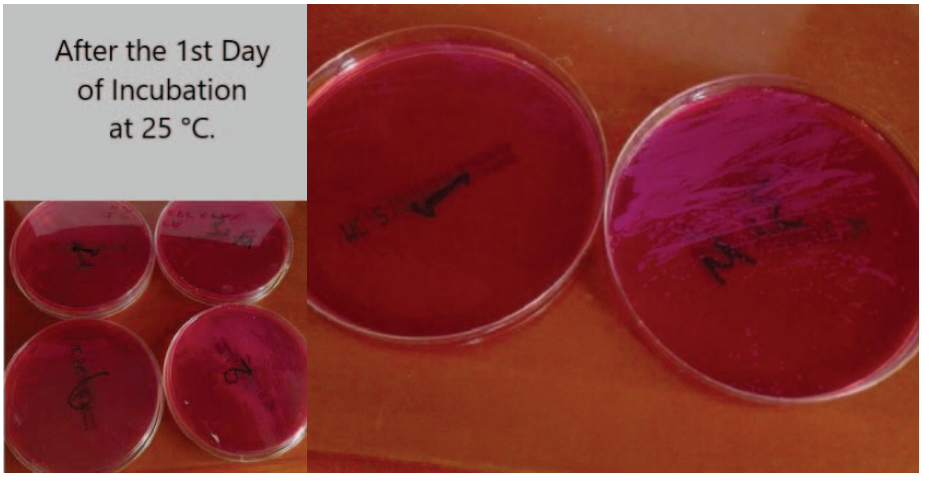


Figure 2. Results after the 1st day of incubation at 25 °C. © Copyright by the authors. Courtesy of Mr Pantelis BOLANIS, MD.

Figure 3. Results after the 2nd day of incubation at 25 °C. © Copyright by the authors. Courtesy of Mr Pantelis BOLANIS, MD.

The results obtained after 24 hours of culture were the following:
Process A. Plate № 2 (smoked before inoculation) had a growth of 80-90% of that of the testing plate № 3 (Figure 2).
Process B. There was almost no growth on plate № 1 (smoked after inoculation) comparatively to the blind testing plate № 3 (not fumigated) of the *Escherichia coli* suspension that had 3.500.000 colonies/cm^3 (Figure 2).
Process C. Plate № 6 (only 1 μl of suspension inoculated) showed 350,000 colonies/cm^3 (Figure 2).
Process D. There was no growth of the *Candida parapsilosis* during the first 24 hours, thus we waited for the next day (Figure 3).

Figure 4. Results after the 2nd day of incubation at 25 °C. © Copyright by the authors. Courtesy of Mr Pantelis Bolanis, MD.

The results obtained after 48 hours of culture were the following:
Process A. The plate № 2 showed 90% of that of the testing plate (Figure 5). In comparison to the testing plate № 3, plate № 1 of the *Escherichia coli* culture showed a growth of 70% of that of the testing (Figure 4).
Process B. In comparison to the testing plate № 3, plate № 1 of the *Escherichia coli* culture showed a growth of 70% of that of the testing (Figure 4).
Processes C-D. The plate № 4 (smoked *Candida parapsilosis*) in comparison to the testing plate № 5 (not smoked) showed a growth of about 20%. The

size of the colonies on plate № 4 was less developed. Later, after 60 hours of culture, the growth on plate № 4 (with fumigation) was 50% of the growth on the testing plate № 5 (without fumigation) (Figure 5.)

Figure 5. Results after the 2nd day of incubation at 25 °C. © Copyright by the authors. Courtesy of Mr Pantelis BOLANIS, MD.

III.2. RESULTS, DISCUSSION AND CONCLUSIONS FROM THE EXPERIMENTS OF THE 1ST LABORATORY

The first experiments were purposely performed at a temperature of 25 °C (room temperature), in order to simulate the possible natural conditions of an ancient Egyptian temple laboratory during Spring. We observed a delay in the growth of the *Escherichia coli* and of the *Candida parapsilosis* after the action of the smoke derived from the *kyphi*-incense. However, the ability of fully destroying like a disinfectant is reduced. We also observed that the time to attain double-growth is augmented by 2-3 times. This means that *in vivo* the microbes will be more easily controlled by the immune system, because the rate of growth is diminished. Finally, the action of fumigation on the substratum material of the plates before inoculation had no effect on the development of the culture. Thus the direct action of smoke on the microbes after inoculation is necessary.

The above experiments were then repeated independently in a different microbiological laboratory, being extended with more elaborate techniques and the study of *cocci*, in order to distinguish the exact action of simple smoke and the smoke from the *kyphi*-incense (see Section IV, *infra*).

IV. REPEATING THE EXPERIMENTS IN THE SECOND MEDICAL LABORATORY

Following our aim to investigate and compare the possible antimicrobial

effect of pure smoke and of the *kyphi* by performing fumigation experiments on known microorganisms (bacteria, fungi and cocci), we repeated our experiments in another Clinical Laboratory (2nd Laboratory). We have examined again the results of the *kyphi* smoke on *Escherichia coli* M. (Gram-negative bacterium), *Candida parapsilosis* L.&T. (fungus), using in addition two Gram-positive cocci (*Staphylococcus aureus* R. and *Staphylococcus capitis* K.&S.) that were not used in the 1st Laboratory.

For the fumigation procedure, the same improvised construction was used, according to the arrangement depicted in Figure 7 (cf. also Figure 1). However, the aforementioned construction was mounted on filter paper and all our experiments were conducted inside a Class II Biological Safety Cabinet (Figure 6) in order to ensure the protection of laboratory personnel and the environment from inadvertent exposure to pathogens or toxins from smoke.

The microorganisms tested in the 1st Laboratory were Gram-negative bacteria (*Escherichia coli*) and fungi (*Candida parapsilosis*), which were retested and supplemented with 2 Gram-positive cocci (*Staphylococcus aureus* and *Staphylococcus capitis*) in the 2nd Laboratory. The collection of microorganisms came from their isolation from cultures of the current daily laboratory practice (e.g.: urine culture, pus culture, skin lesion culture, etc.). Microorganisms were cultured in the following Biomerieux SA Petri Plates: Columbia Agar + 5% sheep blood (COS), Mac Conkey Agar (MCK), Sabouraud Gentamicin Chloramphenicol 2 Agar (SGC2) Petri Plates. The identification of microorganisms in the second experimental part has been done using the automatic identification/susceptibility Test System VITEK® 2 Compact that uses Advanced Colorimetry with which we achieve maximum assurance of the quality of the results (standardization using a Turbidimeter to control the turbidity of the suspension, testing of 20-40 antibiotics with MICs in 3-7 concentrations to test resistance mechanisms, etc.) and high discrimination between species (Gram-negative, Gram-positive, fungi, anaerobes, etc.).

IV.1. Methods and Procedures

Process A. The above plates, which carry selective nutrients for the growth of the *Staphylococcus* spp, Gram-negative bacterium *Escherichia coli* and the yeast *Candida* sp., respectively, were fumigated for approximately 30 minutes with *kyphi* smoke and with pure smoke from charcoal, and then we performed a culture by suspension of the above microorganisms in dilutions of 1/100 and 1/1000 on them. All our cultivations were performed at a constant temperature of 37 °C during the first 24 hours; during the second day the culture of *Staphylococcus* spp and *Escherichia coli* remained at the same temperature, while the temperature for the culture of *C. parapsilosis* was reduced to 25 °C.

Process B. Culture suspension of *Staphylococcus* spp., *Escherichia coli* and *Candida parapsilosis* in dilutions of 1/100 and 1/1000 on Columbia Agar + 5% sheep blood, Mac Conkey Agar and SGC2 Agar Petri Plates respectively. The

plates, after inoculation of the microorganisms, were subjected to a fumigation process for approximately 30 minutes.
Process C. Culture suspension with *Staphylococcus aureus*, *Staphylococcus capitis*, *Escherichia coli* and *Candida parapsilosis* at 1/100 and 1/1000 dilutions on Columbia Agar + 5% sheep blood, Mac Conkey Agar and SGC2 Agar Petri plates respectively, without any smoking procedure.

Figure 6. On the left, aspect of the Fagronlab Class II Biological Safety Cabinet equipped with two HEPA filtres, from the Laboratory of the 2nd Author (Dr Elsa FAVIOU, MD). The HEPA filtered downward laminar flow protects the material used inside the cabinet and the exhaust HEPA filter protects the Environment since it ensures that the air passing through is contaminants' free. The working area is surrounded by negative pressure. Mac Conkey Agar and SGC2 Agar (Biomerieux S.A.) were used for the culture of bacterial and fungal inocula. On the right, aspect of the Lab-Incubator (Binder), used for culture growth. Because of its precise temperature accuracy (0.1 °C; it also fulfills the temperature safety requirements according to DIN12880) this device is especially useful for incubation of cultures at a standard temperature of 37 °C (98.6 °F). © Copyright by the authors. Courtesy of Dr Elsa FAVIOU, MD.

Figure 8 (right). Process A (left side of the photo) and Process B (right side of the photo) Mac Conkey Agar Petri Plates with corresponding indications in the case of pre-smoked, post-smoked plates or controls. © Copyright by the Authors. Courtesy of Dr Elsa FAVIOU, MD.

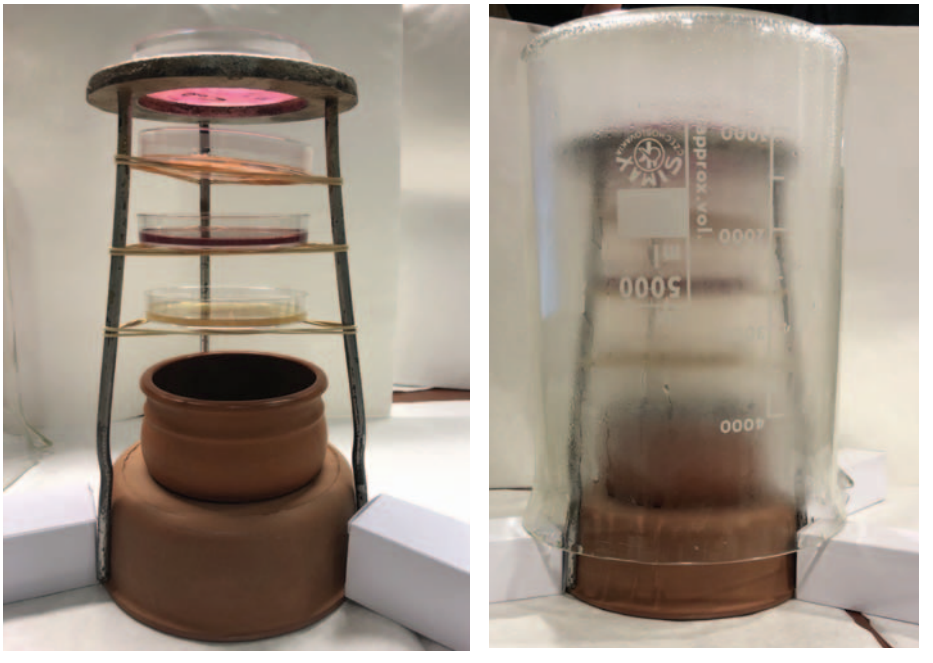
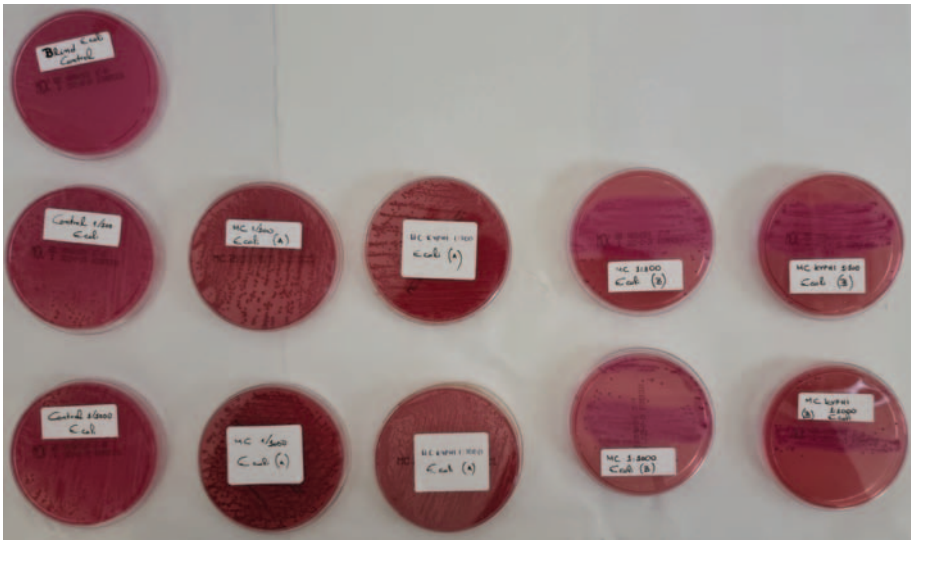


Figure 7. Repeated experimental setting for fumigating the testing plates and cultures in the 2nd Laboratory (Dr Elsa Faviou, MD). The placement of the Petri Plates before (left) and after (right) the initiation of the smoking process (fumigation) is clearly visible. © Copyright by the Authors. Courtesy of Dr Elsa Faviou, MD.



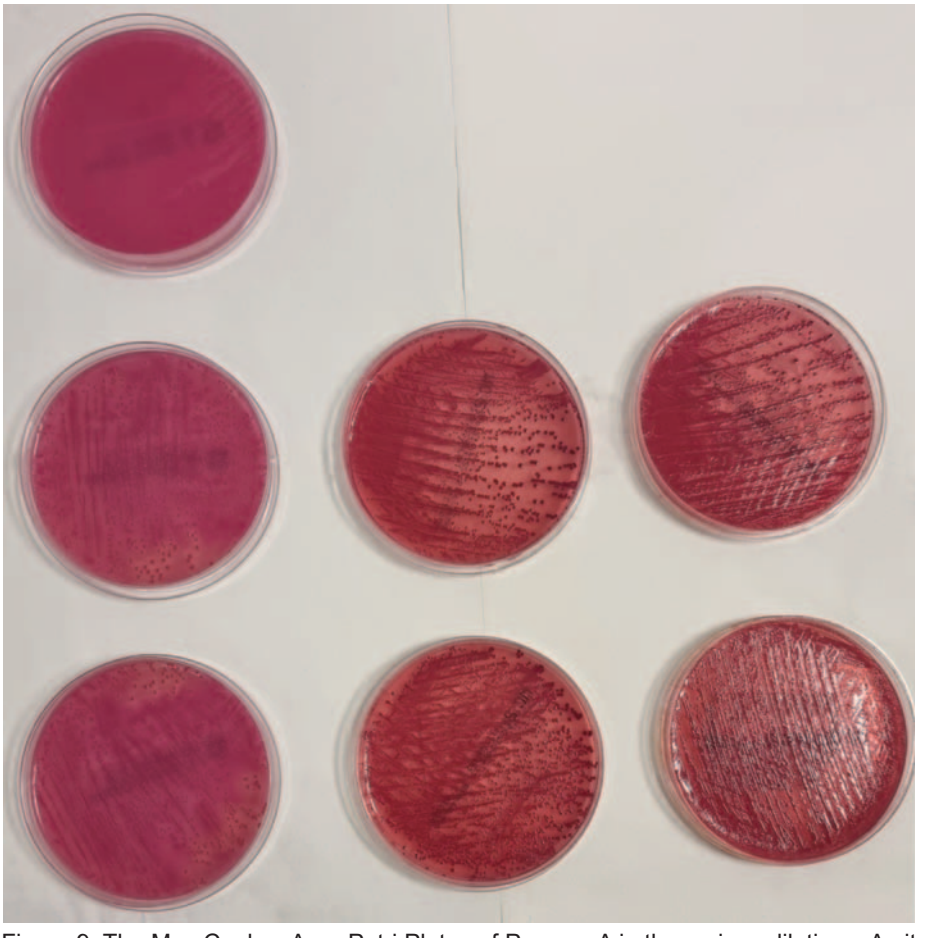


Figure 9. The Mac Conkey Agar Petri Plates of Process A in the various dilutions. As it becomes apparent, no significant differences exist among them in terms of the type of smoking agent. © Copyright by the Authors. Courtesy of Dr Elsa Faviou, MD.

IV.2. Results, Discussion and Conclusions from the Experiments of the 2nd Laboratory

It was observed that the action of fumigation (pure smoke or *kyphi*) on selective and differential culture media has almost no effect on the growth of microorganisms. Indeed, the pre-smoking of the nutritional ingredients of these media (smoking of the plates before the inoculation of the microbes) did not bring about any change in their development, as shown by the comparison of our controls with the plates of process A. Compared to the controls *Escherichia coli*, *Candida parapsilosis*, *Staphylococcus aureus* and *Staphylococcus capitis* the above microorganisms grew competently in the order of 98-100% at all dilutions (Figure 8-11).

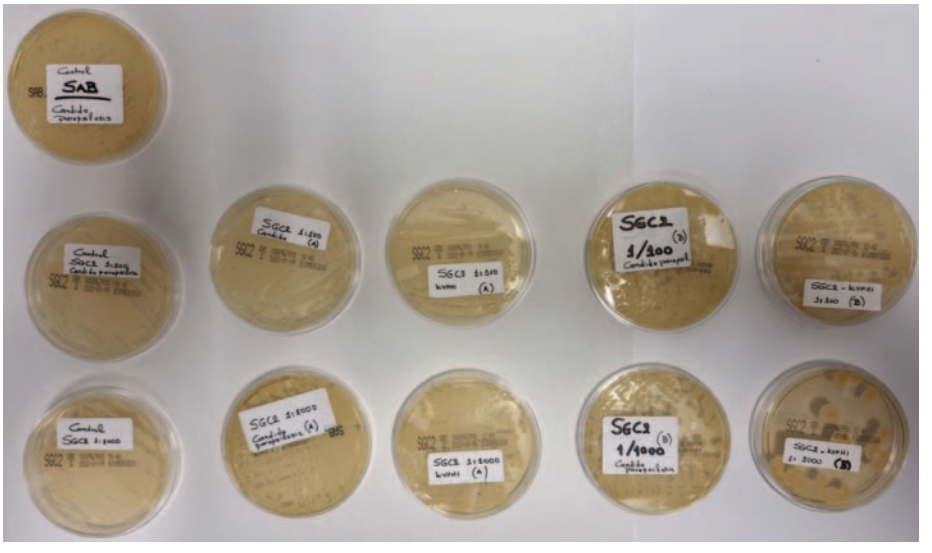


Figure 10. Process A (left side) and process B (right side) SGC2 Agar Petri Plates with corresponding indications in the case of pre-smoked, post-smoked plates or controls. © Copyright by the Authors. Courtesy of Dr Elsa Faviou, MD.

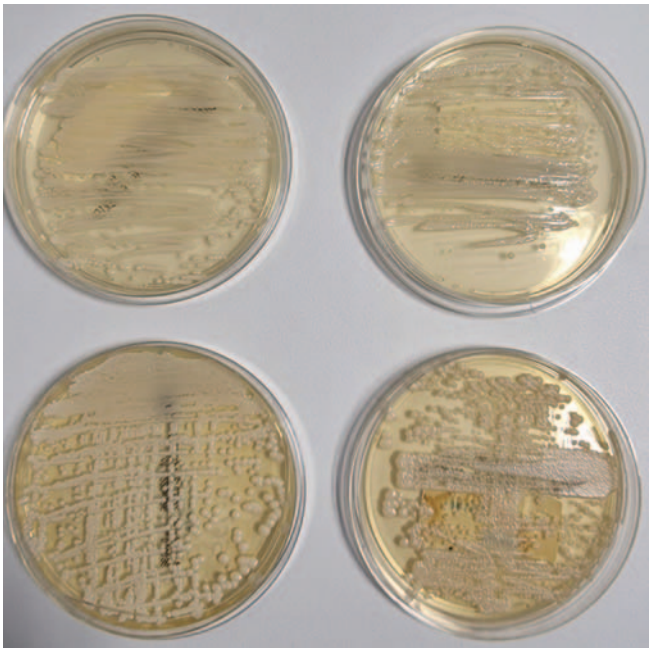


Figure 11. The SGC2 Agar Petri Plates of Process A in various dilutions. As is evident, no significant differences exist among them in terms of the type of smoking agent. © Copyright by the Authors. Courtesy of Dr Elsa Faviou, MD.

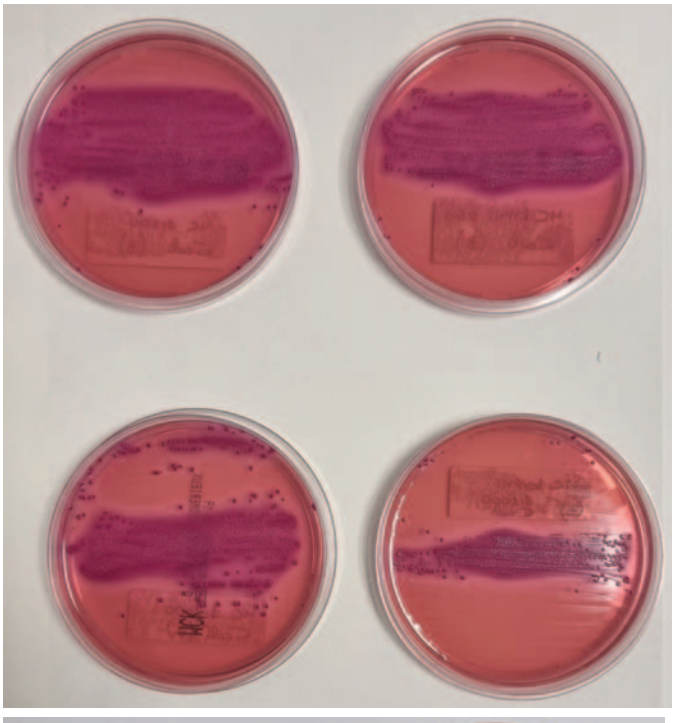


Figure 12. The effect of the different smoking agents on the Mac Conkey Agar Petri Plates of Process B, between them and in relation to the controls. ©Copyright by the Authors. Courtesy of Dr Elsa FAVIOU, MD.

Figure 13. The effect of the different smoking agents on the Mac Conkey Agar Petri Plates of Process B, between them and in relation to the controls. ©Copyright by the Authors. Courtesy of Dr Elsa FAVIOU, MD.

However, regarding Process B the following were found:
1. Compared to the controls of *Escherichia coli*, the plates that were subjected to smoking with the *kyphi* presented a growth of 80% at the dilution of 1/100 and 50% at the dilution of 1/1000, while the corresponding results from the growth of *Escherichia coli* in the pure smoke fumigation process was 95% at the 1/100 dilution and 75% at the 1/1000 dilution (Figure 8, 12).
2. Compared to *Candida parapsilosis* controls, *kyphi*-fumigated plates showed a growth rate of 50% at 1/100 dilution and 20% at 1/1000 dilution, while the corresponding values for 1/100 dilutions and 1/1000 of the pure smoke fumigated plates were 75% and 60%, respectively (Figure 10, 13).
3. Compared to *Staphylococcus aureus* controls, the plates subjected to smoking with *kyphi* showed growth of 90% at the 1/100 dilution and 70% at the 1/1000 dilution, while the corresponding values at the 1/100 and 1/1000 of the pure smoked plates were 90% and 80% (Figure 14).
4. Compared to *Staphylococcus capitis* controls the plates subjected to smoking with *kyphi* showed growth of 70% at the dilutions 1/100 and 1/1000 while the corresponding results from the growth of *S. capitis* in pure smoke-exposed plates were of the order of 85% at the 1/100 dilution and 75% at the 1/1000 dilution (Figure 15).

V. Discussion and Conclusions

By studying the use of *kyphi* ingredients around the World, with the help of ethnobotany, we can see that the actual use of the smoke derived from these plants, corroborates the ancient uses of the *kyphi*, including its action on the lungs and liver, against asthma, for a better smell of the mouth, as perfume for the body and the clothes. Fumigation seems an interesting method of disinfecting houses, food, skin and wounds.

In the present paper, an attempt was made to examine and compare the activity of both the ancient Egyptian *kyphi* and pure smoke on known microorganisms (bacteria, fungi and cocci), the results of which were thoroughly described above.

As we have seen in both Laboratories, the effect of fumigation (pure smoke or kyphi) on culture materials has almost no effect on the actual growth of microorganisms. Indeed, pre-fumigation of the nutrient materials (i.e.: fumigation before the inoculation of the microbes) did not cause any significant change in their growth, as was shown by the comparison of our controls with the plates of the Process A. During Process B it was seen that there is a clear direct effect of smoke (pure smoke and *kyphi*) on all microorganisms with the least pronounced effect occurring on *Staphylococcus aureus*. Here, however, we need to point out that the present research team deliberately chose for *Staphylococcus aureus*, the use of an MRSA (+) strain, i.e.: a strain multi-resistant to a wide range of antibiotics (beta-lactams) that has been created in the last twenty years, due to the excessive and uncontrolled use of antibiotics. Furthermore, the

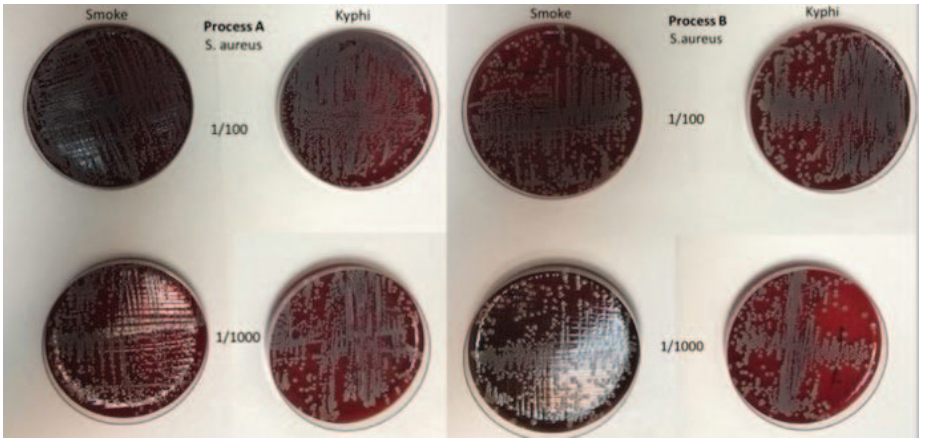


Figure 14. The effect of the different smoking agents on the Columbia Agar + 5% Sheep Blood Plates of Processes A and B for *Staphylococcus aureus* R., between them and in relation to the controls. © Copyright by the Authors. Courtesy of Dr Elsa FAVIOU, MD.

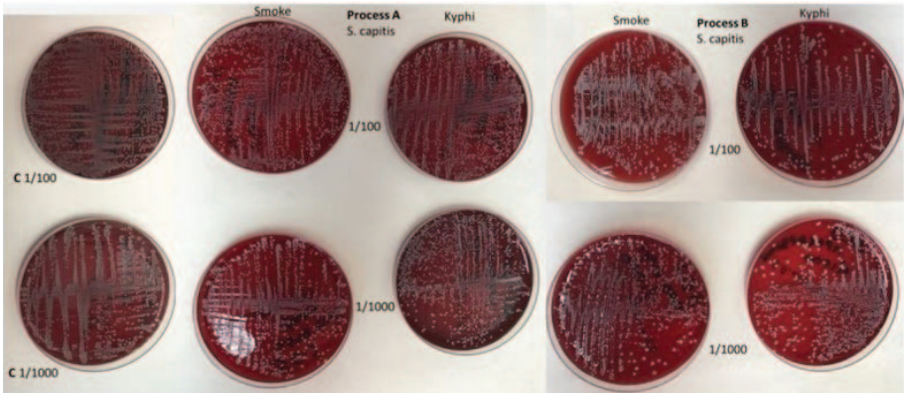


Figure 15. The effect of the different smoking agents on the Columbia Agar + 5% Sheep Blood Plates of Processes A and B for *Staphylococcus capitis* K.&S., between them and in relation to the controls. © Copyright by the Authors. Courtesy of Dr Elsa FAVIOU, MD.

experimental data of our study show that the effect of *kyphi* on yeasts is more significant than that on bacteria or cocci. Moreover, it appears that the direct effect of smoke (mainly with *kyphi*) on microorganisms is stronger for 1/1000 dilutions.

The medicinal and pharmaceutical properties of the *kyphi*'s ingredients

(see Section II and nn 11-26, *supra*), were (more or less) expected to justify the above action of fumigation. The antimicrobial effects of herbs and spices against bacterial pathogens, including *Escherichia coli* and *Candida parapsilosis*, have been thoroughly discussed.[31] The same is true for *Staphylococcus aureus* and *Staphylococcus capitis*.[32]

Therefore, the authors suggest that more experiments (perhaps with new methods and more microbes) need to be carried out, in order to confirm the above conclusions, but also to investigate on the one hand, which might be the most "active" component of the *kyphi*, and, on the other hand, the pathophysiological mechanism through which answers can be given on the antimicrobial action of *kyphi*. *In vivo*, we must also take into account the balsamic properties of the aromatic ingredients of the *kyphi*, their capacity to be absorbed, hence entering the circulation and excreted by the lungs and thus exercising an antiseptic action on the human organism from inside.

The medicinal and pharmaceutical action of the Holy Chrism[33] is expected to be more complex, because of its pleiade of ingredients (57, of which 55 are herbal). Because of the aromatic nature of most of them it should show at least

31 For *E. coli*, see e.g.: Peter 2006: 154-156. For enteric bacterial pathogens, including *E. coli*, with cinnamon oil and its constituents (Cinnamaldehyde and Eugenol) acting against it; cf. also *op. cit.* 352, 429, 449-450], *passim*. For *C. albicans*, see Peter 2006: 361; Samadi et alii 2019, 28-32 (mainly for *C. albicans*, referring also to *C. parapsilosis*, highlighting the best inhibitory antifungal effects of *Lawsonia inermis* L. against these fungi). For the antifungal properties of *Cinnamomum verum* J. Presl = *Cinnamomum zeylanicum* Nees (anc. Eg.: *ti-šps*), see Hsu et alii 2021, 90-117. There is a rather rich literature on this topic, which will not be mentioned here due to lack of space; thus, only the most important related works are mentioned.

32 For *S. aureus* and *S. capitis*, see e.g.: Newstead et alii 2020, 40 (for staphylococcal-produced bacteriocins and antimicrobial peptides acting against them). For *S. capitis*, see Yu et alii 2020, 2017-2026, mainly for short-term clinical antibiotic use associated with resistance mutations, collateral sensitivity, and positive *in vivo* fitness advantages to this *coccus* during infection. For the anti-*Staphylococcus aureus* activity of methanol extracts of 12 plants used in Cameroonian folk medicine, see Fonkeng et alii 2015, 710, the results of which may be connected to the old African tradition of using medicinal plants against pathogenic organisms. Finally, it is worthwile noting that Limonoids (phytochemicals of the Triterpenoid Class), as well as Dehydroabietic Acid, can act against multi-drug resistant pathogens as *S. aureus* and *S. capitis* (see e.g.: Subramani et alii 2017, 172), having in mind that the latter acidic compound is one of the basic constituents of coniferous resins, used also in mummification; cf. ᶜAbd 'el-Maksoud – El-Amin 2011, 129-150. There is a rather rich literature on these topics, which will not be fully mentioned here due to lack of space; thus, only the most important related works are mentioned.

33 See our discussion, in comparison to the *kyphi*, in Maravelia – Filianos 2020, 284-295. See also the classical study Μενεβισογλου [1]1972. Cf. finally Savvits et alii 1989, 1-9; Μενεβισογλου 1999; Savvits – Skaltsa 2016, 317-326; Κωνσταντινιδης – Παλαβιδης 2000.

antiseptic and emollient properties. We are planning to study in scrutiny these properties in the future, using a specimen of this material before consecration.

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Legal Disclaimer and Warning

All authors (Dr Dr Alicia Maravelia, Dr Elsa Faviou, MD, and Mr Markos Filianos) accept no responsibility whatsoever for any illegal misuse, sickness or lethal effects, provoked by the *kyphi*-ingredients, the *kyphi* itself, and/or by other related ingredients, chemical substances of herbal or other provenance and/or recipes studied here (or referred to in this article, including fumigations), to/by minors, unauthorized, amateur, ignorant, mentally disabled, paranoiac or malevolent persons! There are no medical neither toxicological data concerning the ingredients of the *kyphi*, the possible interactions between them and the final product. As the action of smoke/vapours can be very rapid, this product (and its ingredients) could be very harmful for the health of humans and/or animals, causing for instance respiratory, allergic, mental, skin or other serious problems and/or sickness! Therefore all authors, who with the current paper present *bona fide* their scientific, egyptological and ethnobotanical work, as well as the Hellenic Institute of Egyptology and Protipos Diagnostiki, and the Hungarian Publisher, shall not be liable for any loss, expense or damage or any claim whatsoever by a third party for any sickness of any kind (bodily or mental), health problems, death, harm and/or any other issue! None of them shall be liable for any suit arising from any breach of this Disclaimer and Warning or from any misunderstanding of the foregoing terms clarifications and warnings, as well as for any lethal or harmful (mis)use of the *kyphi* and/or its ingredients by anybody, as a result of the scientific publication of this article (which is not an instruction manual of how to prepare *kyphi*, and/or use it for fumigations, but only an egyptological, microbiological and ethnobotanical research).

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Annex: Translations of the Hellenic Sources

Dioscorides I.24:
„Cyphi is the composition of a perfume, welcome to the gods: the priests in Egypt use it abundantly. It is mixed also with antidotes, and it is given to the asthmatics in drinks. There are many ways of the making of it carried about, in which this also is. Take one half a sextarium of cyperus, of full juniperus berries as much, of plum raisins with no stones twelve pounds; resinæ repurgatæ 5 pounds of calamus aromaticus, of aspalathus, and of juncus odoratus, of each a pound, of myrrh twelve drachms, of old wine nine sextarios, of honey two pounds. Having taken out the stones of the raisins, cut and grind the raisins together, with wine and myrrh, and cutting and seeving the other ingredients mix them with these, and let them drink up the liquor one day. Afterward cook the honey, until it comes to a glutinous consistence, mix the resin being melted carefully with it, and then having grinded all the other ingredients diligently together, put them up into a (terra cotta) vase."
(Gunther 1959, 21.)

Galen, *Περὶ Ἀντιδότων II, 2.*
„Damocrate fait mention d'un kyphi dont il est l'auteur et il en décrit soigneusement la composition en ces termes: Le kyphi n'est ni un mélange, ni un corps simple; aucune terre ne le produit, aucune plante ne le laisse écouler après incision. Les Égyptiens, qui le préparent comme je vais dire, le brûlent devant quelques-unes de leurs divinités. Ils prennent des grains de raisins secs bien charnus, puis les dépouillent de leur peau et de leurs pépins. Ils en mesurent 24 drachmes attiques; même poids de résine de térébinthine brûlée; myrrhe 12 drachmes, cinnamome 4, schœnus 12; safran 1 drachme; ongles de bdellium 3 drachmes; aspalathe 2 semis, nardostachys 3, bonne cannelle 3; cyperus pur 3 drachmes; autant de baies de genièvre grosses et grasses, 9 drachmes de calame aromatique, miel en quantité suffisante, vin en faible dose. Ils jettent dans un mortier le bdellium, le vin et la myrrhe, et les broident jusqu'à ce qu'ils aient atteint la consistance d'un miel fluide. Puis ils ajoutent le miel, avec lequel ils ont pilé préalablement les raisins secs. Enfin, ils mêlent toutes les autres substanes après avoir pilées et divisent la masse en petites pastilles rondes, dont ils encensent les dieux. C'est ainsi que Rufus, homme excellent et habil praticien, nous apprend que l'on prépare le kyphi. Quelqueuns, lorsqu'ils n'ont pas de cinnamome à leur disposition, emploient en place des graines de cardamome et les traitent de même. On donne le kyphi à boire, à la dose d'une drachme, à ceux qui souffrent du foie, des poumons, ou des autres parties internes."
(Loret 1887, 78-79)

Plutarch, *Περὶ Ἴσιδος καὶ Ὀσίριδος*: 80, 383e-384c:
„Cyphi is a compound composed of sixteen ingredients: honey, wine, raisins, cyperus, resin, myrrh, aspalathus, seselis, mastich, bitumen, rush, sorrel, and in addition to these both the junipers, of which they call one the larger and one the smaller, cardamum, and calamus. These are compounded, not at random, but while the sacred writings are being read to the perfumers as they mix the ingredients. As for this number, even if it appears quite clear that it is the square of a square and is the only one of the numbers forming a square that has its perimeter equal to its area, and deserves to be admired for this reason, yet it must be said that its contribution to the topic under discussion is very slight. Most of the materials that are taken into this compound, inasmuch as they have aromatic properties, give forth a sweet emanation and a beneficent exhalation, by which the air is changed, and the body, being moved gently and softly by the current, acquires a temperament conducive to sleep; and the distress and strain of our daily carking cares, as if they were knots, these exhalations relax and loosen without the aid of wine. The imaginative faculty that is susceptible to dreams it brightens like a mirror, and makes it clearer no less effectively than did the notes of the lyre which the Pythagoreans used to employ before sleeping as a charm and a cure for the emotional and irrational in the soul. It is a fact that stimulating odours often recall the failing powers of sensation, and often again lull and quiet them when their emanations are diffused in the body by virtue of their ethereal qualities; even as some physicians state that sleep supervenes when the volatile portion of our food, gently permeating the digestive tract and coming into close contact with it, produces a species of titillation. They use kyphi as both a potion and a salve; for, taken internally, it seems to cleanse properly the internal organs, since it is an emollient. Apart from this, resin and myrrh result from the action of the sun when the trees exude them in response to the heat. Of the ingredients which compose kyphi, there are some which delight more in the night, that is, those which are wont to thrive in cold winds and shadows and dews and dampness. For the light of day is single and simple, and Pindar says that the sun is seen ‘through the deserted aether.’ But the air at night is a composite mixture made up of many lights and forces, even as though seeds from every star were showered down into one place. Very appropriately, therefore, they burn resin and myrrh in the daytime, for these are simple substances and have their origin from the sun; but the kyphi, since it is compounded of ingredients of all sorts of qualities, they offer at nightfall.”
(Plutarch 1936, 187-191)