

## Review

The treatment of cancer in Greek antiquity <sup>☆</sup>A. Karpozilos <sup>a</sup>, N. Pavlidis <sup>b,\*</sup><sup>a</sup> Department of Philology, School of Philosophy, University of Ioannina, Ioannina, Greece<sup>b</sup> Department of Medical Oncology, School of Medicine, University of Ioannina, Panepistimiou Avenue, 451 10 Ioannina, Greece

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**Abstract**

Literary sources provide considerable information on the existence of various malignant tumours in the classical period. Based on a close reading of the ancient Greek medical treatises, this paper traces the history of the treatment of cancer by examining the theories of tumour formation, as they were codified by leading physicians of antiquity, together with the therapeutic methods they proposed in their writings. The discussion focuses on a series of medical texts beginning with the Hippocratic corpus (*ca.* 460–370 B.C.) and the voluminous works of Galen (129–199 A.D.) and extends to medical handbooks (Oreibasios, Aetios of Amida, Paul of Aegina) composed in subsequent centuries up to the end of the ancient world (VII c. A.D.).

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**1. Hippocrates (460–370 B.C.): the pillar of medical wisdom**

Hippocrates of Cos is believed to be the first Greek physician to devote special attention to the treatment of cancer. To his keen observations, we owe supposedly the prevailing terminology related to the various kinds of abnormal growths including cancer, carcinoma, ulcer, indurated, hidden, superficial or deep-seated cancer and the like. Yet, there is no unanimity as to the authorship of the books ascribed to his name. In fact, only a few treatises from the Hippocratic corpus are regarded to be genuine works of his, the rest emanating from various medical collections, dated in the fifth and fourth centuries B.C. [1]. Putting aside the question of authorship of the Hippocratic corpus, for practical reasons, we shall refer to him as author of the texts under consideration.

There are about eleven separate sections in the Hippocratic corpus of varying length, in which specific inferences are made as to the pathogenesis and the

treatment of the disease. Considering the overall extent of the corpus, the sections devoted to cancer appear relatively short. Yet, the statements Hippocrates makes about the disease are based solely on clinical observation, one of the cornerstones of Hippocratic medicine. He maintains that in order to treat effectively the tumours one should establish first certain criteria related to the overall condition of the patient and his particular constitution, taking into account his age, the type of tumours at hand and the organs being treated. Males, he believes, do not run high risk, especially after they have reached the age of sixty, and yet they should fear hidden cancers [2]. Elsewhere in his writings, he states that non-congenital cancer does not develop before manhood. The most difficult cases to treat, in his opinion, are those of the axilla, the flank of the body, and the thigh [2,3]. Yet, hidden tumours, he advises, should not be treated at all because they are incurable – the sick usually live longer if they are left without treatment [4]. Last, the theory of four bodily humours, though prevalent in the rest of the Hippocratic corpus, is not linked directly to the formation of tumours nor are they considered to be of inflammatory origin, as subsequent physicians claimed. Perhaps, at that stage, the attention was turned to the manifestation of the disease and not to its causation.

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\* Corresponding author. Tel./fax: +30-26510-99394.

E-mail address: npavlid@cc.uoi.gr (N. Pavlidis).

Hippocrates makes specific mention, among others, of the treatment he administered by cauterising a cancer in the pharynx, with success. In the text the case is recorded as carcinoma, but it is questionable whether it was a malignancy at all [5]. He mentions also the incident of a woman from Abdera who had a breast tumour (carcinoma) with bloody discharge (ikhor) from the nipple and, once the flow stopped, she died [6]. It has been suggested by Grmek [7] that it could have been a case of epithelioma. Be that as it may, in the case of a cancer that appeared after a digestive disorder, Hippocrates advised the patient, if he is robust enough, to drink “elaterion” (nomordica elaterium) [8]. Elsewhere, he refers also to ailments of the uterus, which affect the menstrual period, resulting in hidden small, hard tumours in the breast. If they do not suppurate, these mammary growths normally turn into hidden cancers. In that case, the patient succumbs soon to the disease. The clinical picture he draws (typical of lymphatic spread) is quite telling: the patient suffers from pain, loses appetite, develops bitter taste in the mouth, becomes confused and emaciated [9]. In other instances, when the uterus becomes hard and protrusive it is likely that a cancer will develop. To prevent it, he prescribes a clyster having as basic ingredients the inner part of a wild cucumber mixed with honeycomb in water [10].

## 2. Treatment in the post-Hippocratic period (I–III c. A.D.): Soranos, Dioscurides, Alexander of Aphrodisias, Archigenes, Leonides

When Hippocrates died in Thessaly around 370 B.C. he left behind him a medical system which became the foundation upon which the methodists, the empiricists, and other medical sects that sprang up in the course of time built their respective theories. Yet, there is no way to know how the treatment of medicine advanced after the age of Hippocrates. Our knowledge relies exclusively on the various medical collections that have survived from antiquity and these collections depict to an extent the advancement of medical knowledge. We need hardly add the story recounted by Herodotus (III, 133) of the Persian Queen Atossa, daughter of Cyrus and wife of Darius, who had a breast tumour (phyma) and how she was cured by Democedes of Croton. There are no details about her treatment, but since the term “phyma” designates an abscess as well as cancer, one is inclined to think that the Queen’s ailment had nothing to do with a malignancy. Be that as it may, by the time Galen of Pergamon made his observations on cancer, publishing his principles on anatomy, physiology, and pathology in voluminous works, more than five hundred years in medical praxis had passed. But as stated above, we cannot follow closely the course of its development. What little we know, with regard to the treatment of

cancer, derives from excerpts and fragmentary inferences found dispersed as stray items in various medical collections and particularly in Galen whose writings cover more than five hundred years of development [11].

To be sure, certain works on the subject have been lost, like the treatises on the treatment of cancer by Soranos of Ephesos, physician and prominent gynaecologist, who taught in Rome and Alexandria under Trajan and Hadrian (98–138 A.D.). From his *Diseases of Women* only a series of titles have survived on the treatment of fagedaenic ulcers and breast tumours. Soranos had classified the various types of tumours under categories, distinguishing them according to their susceptibility to cures. In his books, he included a discussion of operable and non-operable tumours [12]. In this connection, we should point out that herbs and medicinal minerals, some of which were introduced from the Far East, were employed along with substances of animal origin in the treatment of cancer and the various recipes and prescriptions are found scattered in a wide range of sources. Pedanius Dioscurides of Anazarbus, (ca. 65 A.D.), practised the empirical maxim “diseases are not cured by talk, but by drugs”, and in his *De materia medica* described about 600 plants and 100 animal and mineral drugs in about 1000 recipes. Some of his remedies refer specifically to the treatment of cancer and were extracted from various plants, such as chick-pea (*cicer arietinum*), adder-wort (*arum drancunculus*), stinging-nettle, brownwort (*scrofularia peregrina*) [13]. Similar remedies we encounter, of course, with some variation in later medical works as well that were based on Dioscurides. He also prescribed herbal drugs derived from terebinth-oil and frankincense, while for the treatment of hidden carcinoma and indurations, he proposed a plaster based on hedge-mustard mixed with honey [14]. Another plaster of his for cancerous growths was based on a mixture made of the ash of crabs, boiled in honey [15]. Alexander of Aphrodisias, who lived about the third century A.D., posed the question of why black bile produces breast cancer and gave the standard answer by citing the humoral doctrine – any imbalance in the humours results in sickness – observing at the same time that in the breast there are many veins in which the black bile accumulates. In short, the cancer which the bile creates in the breast is corrosive, whereas in the leg it produces malignant sores. Furthermore, round ulcers are hard to cure because of the bile they gather [16].

In the same period, Archigenes of Apameia and Leonides of Alexandria wrote important treatises on the treatment of cancer of which only a few excerpts survive in the medical encyclopaedia of Aetios of Amida [17]. Archigenes is known to have exerted great influence on Galen, although the latter did not approve his writing style. In short, Archigenes, whose floruit is placed in the second part of the first century A.D., distinguished two

categories of malignant cancers: the ulcerated ones, black or livid in colour, and the hidden. He cautioned the physician that those that occur in the head, the neck, and the back could not be easily operated upon with the sole exception of breast cancer. In this connection, a major consideration – he noted – was the danger of haemorrhage [18]. Yet, we should point out that the medical views of Archigenes about malignant growths and breast cancer are cited not only by Aetios of Amida, but by Oreibasios and Paul of Aegina as well. Two plasters from his writings for the treatment of sore cancer survive in the works of Aetios of Amida and Paul of Aegina, respectively, [19]. In this connection, it should be mentioned that Archigenes did not encourage operational treatment in breast cancer or the application of many drugs. On the other hand, he is known to have dealt with surgical matters and especially with the removal of breast cancer [20].

Aetios cited also the method that Leonides (first century A.D.) followed in operating on women's breast cancer: after the removal of the affected part, the healthy tissue was cauterised until the bleeding had stopped altogether. The patient was then brought to a warm place, because cold could hinder the recuperation. Next, a plaster was applied to the wound made from plantain (*plantago major*) or from knot-grass (*polygonum aviculare*) or even from sesame-plant. After the removal of the bandage, the wound was cleansed with warm water and a new plaster was applied over it made from boiled lentils mixed with honey. The plaster was covered from the outside with vine leaves or with lettuce and this procedure was continued until the scabs fell off. At this point, only mild remedies were applied on the wound such as ass or women's milk mixed with rose-oil, king's clover combined with the same ingredients, or with zinc oxide, Cadmean earth (i.e. calamine with which cadmium is associated) and the like. This section is supplemented by Aetios of Amida with a series of plasters for ulcerated cancers derived from the lost work of Archigenes. The first in line was composed of lead monoxide, fresh pork fat, white wax, olive oil of good quality, yolk of a boiled egg – all this made into a mixture which was processed in separate parts and diluted before application in rose-oil. Last, for cancerous growths, in general, a more complicated plaster was prescribed: Tyrrhenian (Etruscan) wax, the extraction of terebinth-tree, oxen fat, the marrow of fresh calf or of a deer, castor oil, fresh fat of a duck, fresh honey, frankincense, baked clay or pyrites from copper-mines and hyssop [21].

### 3. Galen of Pergamon (129–199 A.D.)

From the few excerpts we have considered above, it becomes clear that the treatment of cancer had made

some steps forward, although we cannot be sure how steady they were. With regard to the various kinds of tumours and their specific cause, Galen proves to be more specific than his predecessors. For one thing, he distinguishes between names of diseases that refer either to symptoms like “phagedaina” (an ulceration that devours or consumes) or herpes (an ulceration that makes its way like a crawling beast) and to those that are named because of their similarity to external objects like cancer (crab) and polyp (many footed one) [22]. He adopted the humoral theory and taught that they result from excretions of bile in the liver. If the bile is not cleansed through the spleen the veins become congested, thereby creating tumours. This explains why women found in menopause are likely to be affected by cancer of the breast, and why tumours that are black in colour are the most grave. Cancer is curable at an early stage – when the atrabilious humour is not thick – and Galen claims that he had personally healed many cases. Yet, he does not specify the method he had applied. Be that as it may, advanced tumours should be operated upon – cutting around the affected part to avoid damage of the veins – or cauterised, although the latter presents no small risk [23]. He also believed that an unhealthy diet in combination with bad climate are directly connected to the disease. Cancer cases in the north (Germany and Ungarn) are scarce and never occur among the Scythians who drink milk. On the contrary, the disease is common in Alexandria because the inhabitants there consume porridge, lentil, snails, salted meat and even the meat of the ass. Therefore, in the case of cancer purgative medicaments should be used to clean the morbid humours. If the patient is strong enough he recommends that he be subjected to blood-letting, and for women who are under fifty that they be induced to menstruate [24].

For the affected area, Galen prescribes the application of a juice prepared from the plant strychnon – yet his prescription is somewhat vague because the name strychnon is very common and designates various plants: winter cherry (*physalis alkekengi*), hound's berry (*solanum nigrum*), thorn apple (*datura stramonium*) and sleepy nightshade (*witharia somnifera*). He also prescribes zinc oxide, which he himself uses on sore cancers, and, if not at hand, a remedy of his made of rock-alum. As for the daily diet, he recommends porridge of peeled barley, milk, vegetables, such as mallow, orach (*atriplex rosea*), blite (*amaranthus blitum*), and, when in season, round gourd. He also recommends rock-fish and fowls of the air, except those that frequent marsh-waters [25].

A series of cures for the treatment of cancer are found in the section he devotes to medications. He himself developed compound medicines drawing material from a vast range of sources, especially from early Roman imperial physicians. In the section on medications, he mentions zinc oxide again as being the most appropriate

application for healing sores along with lead, which, being mixed with olive oil or wine, cures inflammations and sores in genitals, testicles, nipples and, of course, cancerous growths. “Melted lead” has the same effects also, being especially beneficial for malignant sores and other kinds of cancer [26].

An interesting passage discusses the many medicinal virtues of shell fish – that is, from the calcined shells of whelk, purple shell fish, clam and oyster. Galen describes in detail the way a salve can be made out of them: the shell is pounded until it yields a refined powder, which is then placed on the fire. He insists on this method, particularly the burning of the powdery shell, because he himself had repeatedly made the prescription and had seen its beneficial effects on malignant growths. Besides, the salve made them dry without cutting into them. Mixed also with sour wine, or with honey mixed with wine, it healed putrefied cancers. In a similar way, he describes the preparation of a salve extracted from an oyster shell, which has the exact same properties as shell fish, although its power is somewhat more penetrating on account of its composition. Its constrictive quality heals watery ulcers. When the oyster shell is burnt it releases properties that promote perspiration. Consequently, when the charred powder is placed in water it makes it warm, while the residue becomes a salve, which cures the watery ulcers. This same salve he applied as a plaster, covered with pork fat, on hard to heal deep sores and abscesses. Similar properties are derived from the pulverised ash of burned sea-urchin, snail and crab, but also from garum, i.e. the salted livers of fish [27]. A last prescription is also found in a paragraph devoted to cancerous growths, where he states that a plaster made of the pulverised ash of burned river crab, mixed in with the same amount of Cadmean earth is a good remedy for malignant sores. A similar plaster can be made from the ash of crabs, mixed with cerate or with fine powder of hedge mustard (*Sisymbrium polyceratium*) and honey. This plaster cures malignant growths, old and not yet healed sores, and malignant black spots on the leg along with the malignancies of the breast. At last, he prescribes a remedy for both scrofulous swellings in the glands and for tumours of the parotid glands, consisting of three or five pounds of fat, five ounces of terebinth (*pistacia terebinthus*), five ounces of frankincense powder and five ounces of a kind of fuller’s earth from Sardinia. To this mixture boiled lentils with honey, with caper plant, or with a mixture of both could be added [28].

#### 4. Treatment in late antiquity: Oreibasios of Pergamon (ca. A.D. 320 to ca. 400)

In subsequent centuries, the views on cancer found in various medical handbooks remained basically unal-

tered. We do find, of course, more precise definitions and opinions based upon closer observation, but as far as treatment is concerned, the prescriptions that were issued were more or less derived from the same principles with the addition, as was to be expected, of certain variations. The cause of the disease was attributed invariably to the atrabilious or melancholic temperament of the organism and the treatment prescribed depended upon the composition and thickness of the humour. Acrid humours result in tumours that are neither cleansed nor cured. Only at the beginning can a cancer be prevented from growing – by cleansing the acrid humour and by preventing it from attacking the affected area.

In an early stage of cancer, Oreibasios, the personal physician of Julian the Apostate, prescribed in his Synopsis ad Eustathium a plaster made from “strychnon”, (the name of various plants: winter-cherry, hound’s berry, thorn apple) or from zinc oxide. As to daily diet he repeated in essence Galen’s directions – barley gruel, supplemented by vegetables like mallow, orach (*atriplex rosea*), blite and rock-fish. At this point, we should bear in mind that Oreibasios drew information from the writings of Galen and from other medical writers. His collection of excerpts from the works of Galen is now lost, but another compilation of his with excerpts (*collectiones medicae*) fortunately survives. In another section of his Synopsis ad Eustathium, Oreibasios discusses various cancerous sores and remedies for them, grouping in separate categories the various kinds and relevant prescriptions, some of which are difficult to identify (such as Cyrenaic juice). Other cures he directly derived from Galen in judicious combination with Dioscurides [29].

Elsewhere in the Synopsis ad Eustathium, Oreibasios treats separately hollow sores and those that are overgrown. For the former, he prescribes a long list of remedies in the form of plasters whose basic components are frankincense, barley meal, bean meal, bitter vetch meal, Cadmean earth and zinc oxide, mixed with honey or olive oil according to the need. Cancerous sores could be also treated with horehound (*marrubium vulgare*) or birthwort, in both cases mixed with honey or with olives preserved in salt and pressed to become a plaster. On the other hand, he maintained that the overgrowth of flesh in cancers could be treated with “the flower of Asian stone”, a remedy, as far as we know, not attested in the sources, and with the ash of oyster shells or sea-urchins. With regard to the old, unhealed malignant sores, he prescribed Lemnian medicinal earth (*Lemnium sigillum*, that is silicon dioxide used in remedial preparations even in recent times) [30], which was administered according to the severity of the case and was moulded with wine/sour wine or with a mixture of sour wine and honey to be used as a plaster. In this connection, he mentions a cure based on lead, which goes back to Galen, but with

some variations as to its composition. He explains that lead could be combined with oil derived from roses or from unripe olives or be mixed with the exaction from houseleek (*semper vivum*), navel wort (*cotyledon umbibicus*), flea-wort (*plantago psyllium*), or even unripe grapes [31]. Lastly, in another collection of medical writings, drawing from Xenokrates, he repeats the beneficial effects of the pulverised ash of the purple shell fish and of whelk for the treatment of abscesses and sores and for malignant and consuming cancers, providing various compounds and dosage for the preparation of plasters. The mixture of the powder of whelk with ash lead monoxide, old olive oil, resin of terebinth-tree, frankincense, and water was placed in a pot and moderately boiled with the addition of some olive oil and water. The plaster of whelk could be also used with honey for breast cancer [32].

Oreibasios also mentions a large number of remedies for the treatment of cancer, derived mostly from trees, plants and botanical extractions: feverfew (*erythraea centaurium*), cypress leaves with their globular fruit, the roots of *cyperus rotundus*, the ash of the dry round gourd, the roots of dill (*anethum graveolens*), plantain (*plantago major*), woad – a plant producing a dark blue dye (*isatis indica*), the bark of oak tree, the dry root of sulphur-wort (*peucedanum officinale*), catmint, the leaves of olive tree; but also from lead, gypsum, copper ore, rock alum, yellow orpiment and other similar substances.

A good part of his recommendations was based on older material found mostly in Galen, with the only difference that they are presented in a more systematised way and with additional pharmaceutical material. From the vast amount of information gathered by Oreibasios, the section devoted to the remedies for breast cancer derived from the famous physician Archigenes is worth mentioning. In that excerpt, he registers amongst other remedies two plasters appropriate for the treatment of indurations – one made from the plant “dionysias” or “androsaimon”, the other from linseed mixed with boiled vinegar and honey, fenugreek, or seed of sesame-plant roasted and mixed with honey [33].

## 5. Treatment in late antiquity and the transition to the middle ages: Aetios of Amida, Alexander of Tralles, Paul of Aegina

It has become clear by now that there were numerous remedies for cancer and cancerous growths prescribed in the various extant medical handbooks and that a good part of them had become standardised as they were copied from one collection to the other. With Aetios of Amida, we come to the last major collection of medical writings dated to the middle of the sixth century. Aetios based his Sixteen Books on Medicine on Archigenes, Philoumenos, Galen (and particularly on the pattern set

by Oreibasios), and several other authors whose works have not been transmitted to us. In his collection, there is a whole section, as we have already seen, devoted to breast cancer and cancerous growths and how they were operated upon, which he copied from two earlier sources, Archigenes and Leonides. The treatment of cancer does not figure in the treatise of Alexander of Tralles (VI c. A.D.), except for a short notice in which he cautioned against testaceans – they should not be consumed by patients with breast cancer. Yet, in some cases the patient could include in his diet scallop, whelk, lobster, langouste, and even sea-urchin [34].

Yet a major problem in such compilations is the authorship of those excerpts that are not designated *expressis verbis* with the name of the author. For instance, it is not clear whether the treatment of cancer without ulcers, which Aetios presents in the same section with the excerpts of Archigenes and Leonides is his or is taken from someone else. However, in this particular text, Aetios lists several remedies prescribed for the treatment of non-ulcered cancer: comfrey (*symphytum bulbosum*) placed in bread could be applied as a plaster, and in more serious cases, king's clover with opium poppy seeds (*papaver somniferum*) were to be mixed in sweet wine, which had to be boiled. To the refined mixture were added the yolk of egg, or leaves of marsh mallow (*althaea officinalis*) and all this boiled could be combined with bread. In the same vein, there are several other remedies which are more or less quite familiar from earlier collections – seeds of plantain and of opium poppy along with flea-wort were made into powder and then placed in sweet Cretan wine with the addition of the fruit of date tree. To this mixture was added the fat of duck. Another type of plaster was composed of hedge-mustard with hyssop (*oryganum hirtum*) and honey water. In addition, the leaves of the tree manna ash (*fraxinus ornus*) boiled in water were considered beneficial [35].

The last part of this section refers to the treatment of the cancer of the uterus, which seems to derive from the lost writings of Archigenes. The malignant growth is described as thick and hard, black or livid in colour, somewhat irregular in shape and is not to be operated upon or subjected to heavy pharmaceutical treatment. The ulcers are as a rule decayed, emitting strong odours, and are generally regarded as incurable. The discussion concludes with a series of applications that bring relief to the patient. Some of them are already mentioned elsewhere, to be sure in different mixtures, like fenugreek and marsh mallow boiled in water and honey or in the form of a plaster made of king's clover, spurge and rue (*ruta graveolens*). Some other plasters are mentioned as well, composed of opium poppy mixed with knot-grass or with chicory or coriander. Other prescriptions include the tender leaves of sleepy nightshade mixed in a salve made from roses, or the leaves of mallow mixed in

women's milk together with rose-oil. Utilised in plasters was also the sediment left from hot water in copper or bronze vessels. But these remedies were for external use. When the ulcer of the uterus was bleeding, Archigenes suggested women's or ass' warm milk or a warm ointment made from plantain or from knot-grass with some frankincense. Regarding the same case, he suggested the application into the vagina of medicated plug of wool saturated with saffron, women's milk, poppy (opium) juice, and hyssop (*origanum hirtum*). Still better, he suggested the use of a mixture made of lead monoxide, frankincense, grease extracted from sheep's wool, fresh pork fat, fresh butter and rose-oil. When the mixture became dry in a wooden plate it was moistened with rose-oil [36].

In subsequent collections of medical writings, we do not encounter any new material that would suggest substantial changes in the treatment of cancer. Aetios of Amida on the whole summarised the views of his predecessors, relying mostly on Galen, Archigenes, Leonides and, as we have seen, Oreibasios more or less followed the same method before him. Consequently, the two chapters on cancer that we encounter in the medical treatise of Paul of Aegina, a physician who practised medicine in Alexandria in the first half of the seventh century, prove to be direct borrowings from Aetios and Oreibasios and have nothing new to offer [37]. The large number of remedies recorded in the sources of this period are more or less replicas and underline the gravity of the situation and the fact that medical science stood helpless before cancer, as Gregory of Nyssa (4th c. A.D.) aptly remarked [38]. The disease attacks mostly women and the suffering lasts long with no prospects of recovery, observes another contemporary author, John Chrysostom [39]. The empress Theodora, wife of Justinian, also died of cancer, according to a chronological entry made by Victor Tonnnonnesis in the year 549 [40].

From the Greek Middle Ages, as far as we know, there are no major works on the treatment of cancer. There are a few sporadic inferences made by the polymath Michael Psellos (XI c. A.D.) in a poetic work, but they do not have any originality. What little he has to say about the cancer of the uterus is rather inconsequential and was obviously derived from an ancient source, most likely Aetios of Amida and Paul of Aegina [41]. The only major collection of medical writings in which cancer is dealt with to some extent is that of Ioannes Actuarius, a court physician in Constantinople in the fourteenth century. But again, a careful reading of his text on cancer and indurations proves that he had simply copied verbatim a series of relevant sections from the *Epitome* of Paul of Aegina [42]. The absence of major medical works and of particular treatments of cancer does not necessarily imply complete ignorance of the subject. A comment by an anonymous scribe added to Dioscurides' chapter on what is probably

*aristolochia clematitis* suggests that in the fourteenth century some physicians must have known that clematitis-birthwort could be used against skin cancers, applied as a plaster together with nut grass and honey. In fact, only recently was it discovered that aristolochic acid, found in *aristolochia baetica* and *A. clematitis*, has antitumour properties and can be used in chemotherapy. Two other scribal comments added to Dioscurides' sections on tassel hyacinth and on onion – claim that both help to suppurate and break up tumours [43]. The additions to the text of Dioscurides by the anonymous scribe with regard to the antitumour properties of tassel hyacinth and onion are credited to the advancements of Greek medicine in the Middle Ages.

## 6. Conclusions

We may now attempt to summarise the information provided by the medical treatises we have examined (Table 1). The cause of the disease was linked to the doctrine of the four bodily humours, according to which any imbalance in their disposition results in sickness. Women found in menopause, for instance, were held to be susceptible to breast cancer. The disease was also linked to bad climates. Northern Europeans who consumed milk were unaffected, in contrast to Egyptians who relied on lentil, snails, salted meat, ass meat and the like. A healthy diet, therefore, should include porridge of peeled barley, milk, rock-fish, fowls and vegetables. With regard to the treatment, it should be pointed out that the greater part of the information concerns soft tissue tumours and local applications. Cancer was considered curable only at an early stage. Hidden tumours were not easily operable, and surgical treatment was not encouraged in the head, neck and the back. On the contrary, the treatment of breast, uterus and pharynx figures prominently. The affected part, as in breast cancer, was removed by operation and the healthy tissue was cauterised until bleeding had stopped altogether. On the other hand, herbs, oil, vinegar and medicinal minerals appear in numerous instances in the remedial preparations. Plasters and pharmaceuticals for treating cancerous growths and indurations combined botanical extractions, such as opium poppy seeds, plants, trees, mixed with a variety of substances, such as honey, bees wax, oils and fats, and in combination with lead, gypsum, copper ore, rock alum, yellow orpiment, zinc oxide, cadmium and silicon dioxide. The ingredients were mixed as a rule with wine, vinegar, olive oil and, in several instances, with ass' or women's milk. The latter, was employed perhaps on account of its anti-bacterial properties. Lastly, worth noting is the use of a curative salve derived from the charred powder of shell fish, crabs, whelk or oyster, applied on malignant and putrefied growths. But what was their effect in practice?

Table 1  
Selected remedies of natural products used as drugs in the treatment of cancer

Physician	Period	Natural product	Application	Tumours
<i>Hippocrates of Cos</i>	460–370 B.C.	<i>Nomordica elaterium</i> Cucumber, honeycomb, water	Juice Intravaginal clyster	Cancers Uterus cancer
<i>Dioscurides of Anazarbus</i> <i>Leonides of Alexandria</i>	1st c. A.D. 1st c. A.D.	Terebinth-oil, frankincense, hedge-mustard, honey Ass', women's milk, rose-oil, kings clover, zinc oxide, cadmean earth	Plaster Plaster	Hidden cancers Breast cancer (on sur- gical wound)
<i>Archigenes of Apameia</i>	2nd c. A.D.	Saffron, women's milk, opium, hyssop, lead monoxide, frankincense, pork fat, fresh butter, rose-oil	Intravaginal tamponate	Uterus cancer
<i>Galen of Pergamon</i>	2nd c. A.D.	Tyrrhenian wax, terebinth-tree, oxen fat, calf-marrow/deer-marrow, castor oil, duck fresh fat, honey, frankincense, clay, copper, hyssop	Plaster	Ulcered/non-ulcered cancers
		King's clover, spurge, rue, egg yolk, opium, knot-grass, chicory or coriander	Plaster	Uterus cancer
		Crabs, cerate, hedge mustard, honey	Plaster	"Melanoma" breast cancer
		Fat, terebinth-tree, frankincense, fuller's earth, lentils, honey, caper plant	Plaster	Parotid cancer
<i>Oreibasios of Pergamon</i>	320–400 A.D.	Calcined shells of whelk, purple shell fish, clam, oysters, sea-urchin, crab, sour wine, honey, pork fat, cadmean earth	Ointment	Malignant growths putrefied cancers
		Flower of Asian stone, copper, shell fish, oyster, urchins, pepperwort, silicon dioxide, wine, honey	Plaster	"Sarcomas"
		Ash of purple shell fish, whelk, lead monoxide, oil, terebinth-tree, frankincense, water, honey	Plaster	Cancerous sores breast cancer
		Strychnon: winter cherry, hound's berry, thorn apple, zinc oxide	Plaster	Early cancers
<i>Aetios of Amida</i>	6th c. A.D.	Seeds of plantain, opium, flea-wort, Cretan wine, dates, fat of duck	Plaster	Non-ulcered cancers
		Comfrey, bread, opium, sweet wine, egg yolk, marsh mallow	Plaster	Non-ulcered cancers

Some of these preparations had, no doubt, anti-inflammatory properties, others were sedative or simply analgesic. Yet, there is no clear evidence whether they possessed any antiproliferative attributes as well. As to the prevailing principles in the treatment of the disease, we observed no major changes over the course of time. The theoretical considerations remained basically unaltered and the same prescriptions – in essence – were transmitted from one medical collection to another, from Greek Antiquity and throughout the Middle Ages.

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