

Dioscorides on dental and oral treatments

Dimitrios Koutroumpas, Evangelia Lioumi, Hermione Konstantina Koutroumpas

Abstract: Unprecedented advances in dental knowledge took place during the Roman imperial period. Dioscorides was a leader in the field of traditional dental pharmacology both with his original work "De Materia Medica" and the spurious "Euporista". Thanks to Dioscorides we have an early classification of oral and dental diseases and a greater understanding of dental practice in the first post-Christian centuries. Dioscorides advocated more than 120 drugs for the treatment of toothache and diseases of the gingiva and oral mucosa. Most striking is the use of different verb forms to describe the effects of the drugs he proposes.

Keywords: Dioscorides, Ancient Dentistry, Ancient Pharmacy, De Materia Medica, Euporista

Introduction

Throughout the time of the Roman Empire, dental knowledge increased, culminating in the recognition of dentistry as a field of medicine¹. This is evidenced by the vast number of references to oral and dental diseases in literature of the time, together with the impressive list of medications for the treatment of these conditions. The recording of this rich, dentally related pharmaceutical tradition is largely due to Dioscorides, a pioneer in the field. This is thanks to both his original work "De Materia Medica" and the spurious "De Simplicibus Medicinis" or "Euporista" (which translates as- *remedies that are easily produced*)².

Who was Dioscorides?

Pedanius Dioscorides lived during the first century AD. The exact dates of his birth and death are unknown. Unfortunately, no testimonies on Dioscorides have been salvaged. The limited information about him is included in the prologue of "De Materia Medica". He is believed to have been born in Anazarbus of Cilicia, even though Galen mentions that he hailed from Tarsus, calling him Dioscorides of Tarsus³. For this reason, he bore two ethnic names. Galen's may, however, have been mistaken as there is no evidence confirming his understanding. Moreover, consideration of Galen's belief indicates that his misconception came from the link of Dioscorides with his mentor, Arius of Tarsus, and the recipient of the treatise. Dioscorides' main work can be placed in the second half of the first century AD, according to two references he gives in the prologue to his treatise. The first reference is relevant to the dedication of his work to his fellow-craftsman and mentor Arius of Tarsus, who encouraged Dioscorides to write "De Materia

Medica"⁴. The second and more enlightening evidence is the mention of Lecanius Bassus, who must have been a Roman Senator⁵ and friend of Arius⁶. Subsequently, the book "De Materia Medica" refers to the years between 64 AD and the beginning of the decade of 70 AD. Little is known about Dioscorides' life and studies, other than from a young age he had a never-ending desire for the study of drugs and their effects. For this reason, he travelled widely to study and to develop a personal knowledge of plants and their therapeutic properties⁷. It was commonly thought that he worked as a doctor for Roman legions, but doubt has been cast on this opinion in recent years.

De Materia Medica and Euporista

De Materia Medica

It is considered that "De Materia Medica" was written in the decade of 70AD, the same period that Plinius wrote his encyclopedia titled "Naturalis Historia", which omits to mention the work of Dioscorides. The *De Materia Medica* comprises five volumes⁸. In the first volume, simple drugs derived from herbal aromas, oils, and ointments are recorded. The second volume mentions drugs that are derived from animal products, while in the third volume herbal drugs are presented. In the fourth volume, the description of therapeutic herbs continues but there are also presentations of medical preparations made by fermentation. In the fifth book, Dioscorides focuses on various wine products used as orally administered medicines. In total, over 1000 medicines were included, a remarkable number, when one considers that in the Hippocratic Corpus only 450 types of drugs were recorded. Theophrastus mentioned about 550 and Nikandrus just 300⁹.

Euporista

In "*Euporista*", there are 12 chapters, including descriptions of many medicines for the treatment of dental conditions. As stated, these drugs were easily produced in the home, being made from readily available materials. The classification system, however, is different from one followed in "*De Materia Medica*". The classification is according to ailing parts of the body. This form of categorization, in the later Roman tradition, is called "*a capite ad calcem*" - from top to toe. The system begins with remedies for infirmities on the head and ends with those for the lower parts of the body. In general, this is a reorganization of the drugs mentioned in "*De Materia Medica*", along with later additions, based on the diseases that they treat. Perhaps listing the drugs, according to their natural properties, without explanation of their applications and effects, confused practitioners making "*De Materia Medica*" impractical. This may be why the remedies in "*Euporista*" were rearranged according to the area of the body that they treated. The work is dedicated to the doctor and pharmacologist Andromachus, who practiced during the first century AD in Rome as the head doctor of Emperor Nero¹⁰. As to its authenticity, research has not reached any final conclusions. Undoubtedly, its author had "*De Materia Medica*" as a primary source of information. Later additions support the hypothesis that "*Euporista*" is the work of an unknown author, traced back to the third century AD. This was the initial opinion of Max Wellman, the most reliable scholar and critic of the latest and most accurate editions of the two works. Wellman later revised his opinion, crediting Dioscorides with the treatise¹¹. Apart from questions of authenticity, these two texts are important as they describe the rich pharmaceutical arsenal that was available to the healer of dental and stomatological ailments, whether it be a dentist in Rome, Alexandria or a travelling doctor, as was commonplace in ancient times.

Of great interest is the method used to document medicaments in "*Euporista*", the healer had to make a diagnosis and then identify the most suitable prescription. In contrast, in "*De Materia Medica*", the healer had to know the therapeutic properties of each drug to treat symptoms. Although "*Euporista*" was considered easier to use, it was not as popular as the original work of Dioscorides. "*Euporista*", however, is a better aid to understanding dentistry in the first centuries AD.

Oral conditions

In "*Euporista*", the following dental problems are considered: toothache, tooth extraction, tooth eruption, teething, numbness of the teeth, tooth cleaning, mobile teeth and loose gums, swollen gums, epulides (hyperplasia of the gingiva), gingival recession, aphthae and ulcers, oral decay and bad breath. This list of dental conditions and the therapeutic treatments reveals the rapid development of knowledge in the field of dentistry. Given the occasional mention of dental issues, without any corresponding treatments, in the Hippocratic texts, there is no evidence of advances in dentistry during the period of the Roman Empire. Subsequently, a remarkable pharmacological knowledge of the treatment of dental problems began to emerge.

Drugs for toothache

A vast number of pharmaceutical substances were used to alleviate toothache. Of the 120 drugs recorded in "*De Materia Medica*", almost half (n=58) were used to treat toothache. The vast majority were in liquid form, usually administered as mouthwashes. The treatment for ailments of the mouth was still in an embryonic stage, largely due to the lack of knowledge regarding the anatomy and histology of teeth¹². The first person to study the anatomy of the tooth and to record that they had a nerve supply was Galen of Pergamon, who practiced during the second century AD - a century after Dioscorides. Galen was the first to differentiate between toothache from conditions of the gums, roots, or the interior of the tooth. From the works of Dioscorides', it may be perceived that his use of the term "toothache" was very general and had many meanings.

The number of drugs recommended to treat toothache suggests two things. Firstly, Dioscorides chose the recommended drugs from a collection of pharmacological works written by his predecessors and, following custom at the time, did not cite his sources. Secondly, and most importantly, Dioscorides and previous pharmacologists were reluctant to limit their recommendations, given variation in the effectiveness of the pharmacotherapies to combat toothache. This problem becomes more evident if attention is paid to the words and phrases with which Dioscorides often hides his ignorance and doubts over certain substances. The pharmaceutical substances used to

treat toothache were prescribed in the following manner:

- i) boiled in wine or vinegar to produce a mouthwash
- ii) chew on the aching tooth
- iii) for filling the cavity in the decayed tooth
- iv) as a plaster around the ailing tooth
- v) drops in the ear on the opposite side to the ailing tooth
- vi) drops in the nostril on the opposite side to the ailing tooth
- vii) amulets against pain.

The prescription often included the use of an adjunct amulet. The use of amulets, with claimed therapeutic actions, was recommended by Dioscorides and other important pharmacologists, such as Galen of Pergamum¹³.

The study of drugs to alleviate toothache offers valuable information about the organic and inorganic substances used and their effectiveness. The first question is: To what extent Dioscorides believed that these drugs were effective? A second question is: Could the drugs be classified according to their potency?

If the prescriptions for each pharmaceutical substance are examined, it is possible to categorize their potency, according to the verb used to describe their action. Usually, the first mentioned substance in each treatment group is the most suitable and most effective. Dioscorides then uses a series of verbs to categorize the potency of each substance. He does not give detailed information about their therapeutic value. So, it is possible to categorize the substances into five groups:

Group 1 is the substance that heals (*ἰᾶται*) toothache as no other does [*καὶ ὀδονταλγίας ὡς οὐδὲν ἕτερον ποιεῖ*]¹⁴. An Arabic Gum, Bissa Bol (*κάγκαμον*, Table 1) is the drug that treats toothache more effectively than any other. Dioscorides mentions that Bissa Bol consists of the sap of the trunk of *Balsamodendron Katuf*. Of the same potency is the mineral melanterite (*σῶρι*) which Dioscorides says “*treats toothache when placed on teeth cavities*”¹⁵.

Group 2 includes the strongest drugs and uses the verb «*παύω*» (stop). There are thirteen drugs in this group, with three types of therapeutic properties. Within the 2nd group there are three



Figure 1. Pimpernel (*Αναγαλλίς ἡ κυανή*, *Anagallis arvensis*) according to Dioscorides stops toothache among other pharmaceutical properties, [Codex Neapolitanus Graecus 1 of the National Library of Naples fol. 15r]

different expressions in Greek which have exactly the same meaning: *stop the pain*. Through these three equivalent phrases, Dioscorides chooses to notify the capability of the drugs in group 2 to radically control dental pain. Pimpernel (*ἀναγαλλίς*, Table 1), a type of milkweed, stops toothache [*καὶ ὀδόντος πόνον παύει*] when it is poured into the nostril on the opposite side of the mouth that said tooth is located¹⁶. The second expression commonly used is to declare the drug stops the pain [*παύει ... τὴν*]. Cedar (*κέδρος*, Table 1), a coniferous tree, can stop the pain when drops of cedar decoction are placed in the tooth cavity, or if it is mixed with vinegar and *ἀλγηδόνα* used as a mouthwash in the painful area¹⁷. The third phrase used is that it stops toothache [*ὀδονταλγίας παύει*]. For example, the root of the plant Plantain (*ἀρνόγλωσσον*) stops toothache either as a decoction for a mouthwash or when the root is chewed [*ἢ δὲ ῥίζα ἀφεψηθεῖσα καὶ διακλυζομένη ἢ αὐτὴ διαμασσωμένη ὀδονταλγίας παύει*]¹⁸.

Group 3 includes the drugs which have the property of alleviating, but not eradicating toothache. This category of drugs is one of the largest in "*De materia medica*" and includes fourteen medicines.

Two verbs are used to describe their actions. The first expression is that it calms the pain [*ὀδόντος τε πόνον πραϋνεί*] or [*ὀδονταλγίας τε πραϋνεί*] calms toothache. For example, Hyssop (*ὕσσωπος*, Table 1) calms the pain [*ὀδόντος τε πόνον πραϋνεί*] when boiled in vinegar and the mixture is administered as a mouthwash¹⁹. The beverage of the root of Mullein (*φλόμος*, Table 1), a herb which is known by the same name today, when mixed with wine and used as a mouthwash, calms toothache [*ὀδονταλγίας τε πραϋνε*]²⁰. The second expression of identical meaning is «*κουφίζει*» that means it



Figure 2. Ivy (Κισσός, *Hedera helix*) boiled with rose oil was instilled to the opposite nostril of the aching tooth to help in case of the toothache as Dioscorides mentions. [Codex Neapolitanus Graecus 1 of the National Library of Naples fol. 55r]

lightens the pain (the word is of the same root and meaning as in *ἀνακουφίζει*). The use of the verbs to lighten (*ἀνακουφίζω*) or calm (*καταπραΰνω*), characterize the same beneficial influence of a drug which does not stop toothache but makes a noticeable difference. A characteristic example is Spurge (*τιθύμαλλος*, Table 1), which can relieve the pain [*τῶν ὀδόντων τὰ ἀλγήματα*] when it is used to fill “corroded cavities”²¹. The term “corroded cavities” (*διαβρωμένες κοιλότητες*) was used to describe loss of tooth tissue either by caries or abrasion. Similarly, the root of the herb Ranunculus (*βατράχιον*, Table 1), a species that looks like celery, is used as a plaster and reduces toothache [*καὶ ὀδονταλγίας κουφίζειν*]²².

Group 4 contains substances which either just help (*βοηθεῖ*), or benefit (*ώφελεῖ*), in cases of toothache, possibly, with limited effectiveness. For

example, Tamarisk (*μυρική*), a beverage made out of its leaves mixed with wine and used as mouthwash, can help with toothache [*καὶ ὀδονταλγίας βοηθεῖ*]²³. Also, *Μελάνθιο* (lat, *Nigella sativa*), commonly known as Black Cumin, is beneficial for toothache [*ώφελεῖ καὶ ὀδονταλγίας*] as a mouthwash when boiled with vinegar and pinewood with high a concentration of resin (*δαδί*)²⁴. The degree of benefit is unknown, since effectiveness is not discussed.

Group 5, comprises simple medicaments which Dioscorides believes are suitable against toothache and are described using the verb “make” (*ποιῶ*). This group included herbs like Fish Thistle (*λευκή ἄκανθα*, Table 1). The decoction of its root is suitable for treating toothache when used as mouthwash [*πρὸς ὀδονταλγίας ποιεῖ διακλυζόμενον*]²⁵. There are also these without any special reference to their action, but they are just mouthwashes for toothache.

Most of these remedies are plant based. Usually, the extract of the root is mixed with either wine or vinegar. Wine has mild antiseptic properties, as it contains ethyl alcohol but it is doubtful that it would have any effect on toothache. However, many of the herbs described have some therapeutic and possibly analgesic properties. For example, the root of Henbane (*ύοσκάμος*, Table 1), when boiled with vinegar, can be used as mouthwash in cases of toothache²⁷. The leaves and roots contain potent alkaloids, such as scopolamine and hyoscyamine. These alkaloids are suppressants of the central nervous system and it is possible that they might have had some local analgesic action when used as mouthwash²⁸.

The use of lizard liver to fill the cavity of a decayed tooth cannot be considered as an orthodox dental practice. It was therefore surprising to read in Dioscorides work that “*the liver of the lizard when placed in the decayed tooth cavities ceases pain*”²⁹ [*τὸ δὲ ἥπαρ αὐτῆς {σαύρας} ἐντεθὲν τοῖς τῶν ὀδόντων βρώμασιν ἀπονίαν ποιεῖ*]. The description of snake skin being boiled in wine³⁰ or of frogs boiled in water and vinegar³¹ will probably revolt the modern reader. Nevertheless, before criticizing Dioscorides, it needs to be remembered that the majority of these substances were also used as components in Galen’s complex medicaments, and in medieval dental practice.

	Substance	Administration	group ^a
1	κάγκαμον (~ Commiphora kataf Forsk., ~ Styrax benzoii Dryand., Balsamedron Katuf, Bissa bol)	diluted in wine	1 st
2	ρόδιον (Rose oil)	as mouthwash	5 th
3	πίτος (Pinus laricio, Pine)	leaves decoction with vinegar	2 nd
4	άσφαλτος (asphalt)	molded and placed around the tooth	3 rd
5	κέδρος (Juniperus L., Cedar)	a. instillation in the decayed tooth b. mouthwash with vinegar	2 nd
6	πλατάνου τὰ τρυφερά τῶν φύλλων (The tender leaves of the plane tree)	decoction with vinegar as mouthwash	5 th
7	μυρική (Tamarisk)	decoction with wine as mouthwash	4 th
8	άμόργη (Amorge)	application with vinegar, wine or mead	5 th
9	Αἰθιοπικῆς ἐλαίας δάκρυον (The sap of the Ethiopian Olive tree)	instillation into the decayed tooth cavity	5 th
10	κηκίς (Cecis)	coating the decayed cavity	2 nd
11	ρόυς (Rhus Coriaria L., Sumac)	inserted into the decayed cavity	5 th
12	μοριά ἢ σκιάμινον δένδρον (Morus nigra L., Mulberry)	as mouthwash	5 th
13	ὄπός συκῆς (Ficus Caria L., Figs)	lamb's wool impregnated with the juice and packed into the cavity	4 th
14	γῆρας ὄφεως (The slough of a serpent)	boiled with wine as mouthwash	4 th
15	τρυγόνος θαλασσίας τὸ κέντρον (The slough of a serpent)	because it breaks and unroots the ailing tooth	3 rd
16	Βάτραχοι (Frogs)	decoction of boiled frogs in water and wine as mouthwash	4 th
17	Εἰλάφου κέρας (Hart's horn)	boiled in vinegar as mouthwash	5 th
18	σαύρας ἥπαρ (Lizard liver)	packing the liver in the decayed tooth cavity	2 nd
19	γῆς ἔντερα (Earthworms)	boiled in oil and instillation to the ear of the opposite side	4 th
20	Λάπαθον (Rumex sp. L., Monk's Rhubarb)	decoction boiled with wine as mouthwash	5 th
21	ἀσπάραγος (Asparagus Officinalis L., Asparagus)	decoction for mouthwash	4 th
22	ἀρνόγλωσσον (Plantago major sp. L., Plantain)	as decoction of its root or chewing	2 nd
23	ὀριόσκορδον (Allium Sativum L., [The wild]Garlic)	the decoction with resin rich pine wood and frankincense hold in the mouth	3 rd
24	ἀσφόδελος (Asphodelus sp. L., Asphodel)	the soup of the root with incense, honey, wine and myrrh; instillation to the ear of the opposite side to the aching tooth	3 rd
25	κάππαρις (Capparis spinosa L., Caper)	boiled with vinegar as mouthwash or chewing by the aching tooth	2 nd
26	λεπιδιον (Lepidium latifolium L., Pepperwort)	as an amulet hanging from the neck	5 th
27	βατράχιον (Ranunculus sp. L., Ranunculus)	dressing the tooth with the root	3 rd
28	ἀναγallis (Anagallis arvensis L., A. caerulea, Schreb., A. phoenicea Scop., Pimpernel)	instillation to the nostril of the opposite side to the aching tooth	2 nd
29	κισσός (Hedera helix L., Ivy)	boiled with rose oil; instillation to the ear of the opposite side to the aching tooth	3 rd
30	χελιδόνιον μέγα (Chelidonium majus L., Celadine)	plaster of the root with wine; chewing	2 nd
31	[χαμαιλέον] ὁ μέλας, ἡ οὐλόφορον (Cardopatum Corymbosum L., Chameleon thistle)	the decoction of the root or mixed with equal quantities of pepper and wax	2 nd
32	ἄκανθα λευκή (- Cnicus ferox L. or ~ C. acarna L., Fish thistle)	decoction of the root as mouthwash	5 th
33	ὄνονις (Ononis antiquorum L., Rest harrow)	decoction with sour wine and water as mouthwash	3 rd
34	λευκάκανθα (Cnicus tuberosus sp. L. or Cirsium Tuberosum All., Tuberous thistle)	chewing the root	3 rd
35	ὑσσώπος (Satureia graeca L. = Micromeria Graeca Benth., Hyssop)	decoction with vinegar as mouthwash	3 rd
36	πάνακτες Ἡράκλειον (Oporonax hispidus Grisp., Hercules' woundwort)	placed in the decayed tooth cavity	5 th
37	πύρεθρος (Anacyclus Pyrethrum DC = Anthemis Pyrethrum L., Pellitory)	decoction with vinegar as mouthwash	4 th
38	πενκέδανος (Peucedanum Officinale L., Sulfurtwort)	placed in the decayed tooth cavity	5 th
39	μελάνθιον (Nigella sativa L., Black cumin)	decoction boiled with resin rich pine wood and vinegar as mouthwash	4 th
40	σίλφιο (~ Ferula Tingitana L., Laserwort)	in the cavity and coating perpendicular to the tooth along with frankincense	4 th
41	χαϊβάνη (Ferula Galbaniflua Boiss. and Buhse., Galbanum)	in the cavity and coating perpendicular to the tooth	2 nd
42	μελισσόφυλλον (Melissa officinalis L., M. Altissima Sibth. and Sm., Balm)	decoction as mouthwash	5 th
43	ἀλθαία (Althaea officinalis L., Marsh Mallow)	decoction of the root with vinegar as mouthwash	3 rd

44	κλήματις (Vinca Minor L., Periwinkle)	chewing the leaves and sprouts	2 nd
45	Πολέμωνιον (Polemonium Caeruleum L. or Hypericum olympicum L., Jacob's ladder)	chewing the root	2 nd
46	Πεντέφυλλον (Potentilla reptans, L., Ciquefoil)	decoction of the root	2 nd
47	ὕοσκάμος (Hyoscyamus sp., L., Henbane)	decoction of the root with vinegar as mouthwash	5 th
48	στρήχον ὕπνωτικόν (Withania somnifera L., Sleepy nightshade)	decoction of the skin with wine as mouthwash	4 th
49	ἐφήμερον (Polygonatum Multiflorum All. and P. verticillatum All., Ephemerum)	decoction of the skin as mouthwash	5 th
50	φλόμος (Verbascum sp. L., Mullein)	decoction of the root with wine as mouthwash	3 rd
51	ἄρκτιον (~ Inula Candida L., ~ Celsia Orientalis L., ~ C. acaulis Bory etc., Bearwort)	decoction of the fruit and the root with wine as mouthwash	3 rd
52	σίκος ἄγριος (Ecballium Elaterium Rich., Squinting cucumber)	decoction of the root with vinegar as mouthwash	4 th
53	σταρίς ἄγρια (Delphinium Staphisagria L., Stavesacre)	decoction of the root with vinegar as mouthwash	4 th
54	ἐλλέβορος μέλας (Helleborus Cyclophyllus L., Black hellebore)	decoction of the root with vinegar as mouthwash	3 rd
55	τιθύμαλλος (Euphorbia L., Spurge)	filling the tooth cavity with the juice and perpendicular obturation with wax	3 rd
56	κολόκυνθα ἄγρια (Citrullus Colocynthis Schrader, Colocynth)	decoction with vinegar as mouthwash	4 th
57	ὄζος (Vinegar)	mouthwash	5 th
58	σάρι (Mclanterite)	when placed on teeth cavities	1 st

* group1 (most effective) -> group5 (least effective)

Table 1: Substances suitable to treat toothache according to Materia Medica (translation of ancient Greek names of substances as suggested by Beck²⁶)

Drugs for periodontal diseases

The second large category of medicaments is for the treatment of periodontal diseases. These are mostly plant based remedies for the management of mobile teeth. Unfortunately, the medicaments described are not accompanied with any information about the causes or the type of disease resulting in tooth mobility. From studies conducted on skeletal remains, it is evident that ancient man was subject to many periodontal diseases which resulted in the loss of teeth³². The main remedies in both of Dioscorides's works acted as styptics. These were substances which had the property of causing contraction of the gingiva, following the principle of antipathies. According to this principle, a drug which reverses the cause of the ailments is administered. Vinegar flavored with squills (*antipathies ὄζος*) when used as a mouthwash supposedly hardens the gums making teeth less mobile [πρὸς *antipathies*as *antipathies*]³³. Similarly, the leaves of the pomegranate tree (*antipathies*α, Table 2) have styptic properties and their extract was thought to be useful for cleaning loose gums and mobile teeth [*antipathies πλααantipathies καὶ antipathies antipathies*]³⁴. The juice of olives that have been turned into a paste in brine, referred to as “*olives that swim in pickling brine*” (*antipathiesβantipathies ἐλαῖαι*), were thought to contract swollen gums and stabilize mobile teeth. Generally, olives and especially wild olives have styptic properties and were used in

many ways to treat oral and dental problems. The chewing of wild olives was recommended for curing aphthous ulcers, mouth ulcers, preventing gingival discharge and of course, alleviating toothache³⁵.

Apart from organic materials, *De materia medica* also advised the use of minerals to tackle mobile teeth. Alum which has styptic properties, when mixed with either honey or vinegar was thought to tighten the gums and strengthen loose teeth³⁶. Other inorganic materials used to combat loosening of the teeth were: melanterite (σῶρι)³⁷, pumice stone (*antipathies*)³⁸ and mineral salt mixed with honey³⁹ (Table 2). What all these inorganic substances have in common is their styptic action which contracts the gums and limits the movement of loose teeth.

There is a group of organic and inorganic substances used as a cure for mobile teeth which can only be found in "*Euporista*". For example, a mixture with equal quantities of myrrh, shale and starch⁴⁰, or a mixture of pomegranate skin, ceca and vitriol. Most of the ingredients have styptic properties contracting the gums.

A search of the literature confirms that many books on herbal therapy dedicate page upon page to the healing properties of mandrake. Mandrake is not included in "*De materia medica*" even though it contains alkaloids similar to those found in Henbane.



Figure 3. Henbane (Ὑοσκύαμος *Hyoscyamus niger*: the decoction of the root with vinegar can be used in case of toothache as mentioned by Dioscorides. [Codex Neapolitanus Graecus 1 of the National Library of Naples fol. 146r]

Yet, in "*Euporista*", mandrake is part of an unusual remedy to cure mobile teeth. This involves boiling frogs, vitriol⁴¹ and mandrake root. However, it is not a coincidence that it is the last one recorded in that section. It is usually observed that unusual medicines or ones with mystical properties appear at the end of the list.

Periodontal diseases continued to be discussed in chapters 74 and 75 of the Wellmann edition of "*Euporista*". Only limited numbers of substances are used to treat any kind of inflammation, ulcers or other problems of the gingiva in "*De materia medica*" (Table 2). They are remedies which were believed to be able to combat a large variety of dental illnesses. The action of the herbs bisabol and green olive oil have already been mentioned in the first volume of "*De materia medica*". These substances were thought to have antiseptic properties and to tighten gums. The same applies for the plant Cecis (κηκίς, Table 2) the fruit of which has styptic properties that, is recommended for limiting epulis and gum discharge [ἀμφοτέρα δὲ στύφουσιν ἱκανῶς καὶ στέλλουσι λείαι τὰς ὑπερσαρκώσεις ρευματισμούς τε οὐλῶν]⁴².

The second and third books do not contain any substances for gingival ailments. In the fourth book, caltrops (τρίβολος χερσαῖος, Table 2) and water chestnut (τρίβολος ἑνυδρος, tabl. II) are the only plants recorded, thanks to their styptic action. They can be used as a plaster for every inflammation. According to Dioscorides, when combined with honey, it cures ulcers, purulent drainage of the oral cavity, the tonsils and gingivae⁴³. Wild raisins have similar properties when boiled with vinegar and used as mouthwashes⁴⁴.

In the fifth book, both organic and inorganic materials are recommended for the healing of pathological conditions of the gingiva. For example, according to Dioscorides, wine flavored with myrtles (μυρσινίτης οἶνος) is recommended for curing small ulcers of the gums⁴⁵.

Drugs for diseases of the oral mucosa

Other conditions considered by Dioscorides were inflammation and ulceration of the oral mucosa. Just as with the management of periodontal problems, there were more medicaments to treat the mucosa recorded in "*Euporista*" than in "*De materia medica*".

The most interesting oral pathological condition

	Substance	Indication
1	κάγκαμον (~ Commiphora Kataf Forsk., ~ Styrax benzoin Dryand., Bisabol)	gingiva putrefaction (mixed with wine)
2	ἐλαίον ὀμφάκιον (Olive oil from unripe olives)	tightens the gums
3	σμήρυα (Commiphora myrrha Engl., C. anglosomaliae Chiov., Myrrh)	strengthens the gums
4	σχίνος (Pistacia lentiscus L., Mastc)	tightens the gums and stabilizes the mobile teeth
5	ρόδα (Rosa, sp. L., Rose)	discharges of the gingiva
6	λύκτιον (Rhamnus petiolaris Rh. lycoides, Rh. punctata Boiss., Dye's buckthorn)	lesions of the gingiva
7	ἀγριελιά (Olea europaea L., var. silvestris Miller, Wild olive)	a. shrinks swollen gums (wild olive brine pulp), b. gingiva putrefaction (wild olive oil), c. discharges of the gingiva (steam bath with oil)
8	κολυμβάδες ἐλαῖαι (The olives that swim in pickling brine)	brine pulp minimizes swollen gums stabilizes the mobile teeth
9	Κηκίς (Cecis)	hypersarcomas and discharges of the gingiva
10	ρόδα (Punica granatum L., Pomegranate)	tightens the gums and stabilizes the mobile teeth (flower decoction)
11	κοκκυνηλιά (Prunus domestica L., Plum)	discharges of the gingiva (decoction of the leaves with wine)
12	αἰδοῦρνό γάλα (Ass's milk)	strengthens the gingiva (as a mouthwash)
13	βούτυρον (Butter)	Gingiva irritations in kids (mixed with honey)
14	γλήχων (Mentha Pulegium L., Pennyroyal)	gingiva-strengthening (broken and burnt)
15	ἀρνόγλωσσον (Plantago major sp. L., Plantain)	blood supply of the gingiva (swallow the juice of leaves)
16	ἀριστολοχία (Aristolochia Rotunda L.A. longa L., A / Clematitis L., Birthwort)	cleanser of the gums
17	ἀλόη (Aloe vera L., Aloe)	suitable for the gums without any specific indication (mixed with honey or wine)
18	A.τρίβολος χερσαῖος (Tribulus Terrestris L., Caltrops) B.τρίβολος ἔνυδρος (Trapa Natans, L., Water chestnut)	inflammations of the gums (mixed with honey)
19	βάτος (Rubus Ulmifolius Schott, Bramble)	strengthens the gingiva (chewing the leaves)
20	σταφίς ἀγρία (Delphinium Staphisagria L., Stavesacre)	ceases the discharges of the gingiva (decoction with vinegar)
21	οἰνάνθη (Oenanthe)	a. beginning gingival abscess (fresh and dried as a cataplasm), b. treatment of bleeding and retracting gums (mixed with honey)
22	ὀμφάκιον (Omphacium)	loose gums (mixed with wine or honey)
23	ὄξος (Vinegar)	Shrinks bleeding and retracting gums
24	σκιλλητικόν ὄξος (Vinegar flavoured with Squill)	gingiva putrefaction
25	μυρσινίτης [οἶνος] (Wine flavored with Myrtles)	Gingiva ulcers
26	ἰὸν ξυστόν (Verdigris)	Tackles Epulides (hypersarcomas) and protrusion of the gums
27	χαλκίτην (Rock alum)	gingiva inflammations
28	σῆρι (Melanterite)	strengthens the mobile teeth
29	στυπτηρία (Alum)	tightening loose gums
30	κίσηρις (Pumice stone)	strengthens the gingiva
31	ἄλας ορυκτόν (Salt mine)	tackles loose gums
32	λίθος ἀλαβαστρίτης (Alabaster)	strengthens the gingiva
33	λίθος σμύρις (Emery)	cleansing loose gums

Table 2: Substances suitable to treat gingival diseases according to Materia Medica (translation of ancient Greek names of substances as suggested by Beck²⁶)

of this category was the management of aphthous ulcers. This is the only condition that is described in detail. Other ulcerations were described as “corrosive ulcers” or “oral decay”. Unfortunately, there is no detailed description of these conditions. For instance, it is difficult to perceive how foul-smelling exudates in the mouth [ἐν στόματι

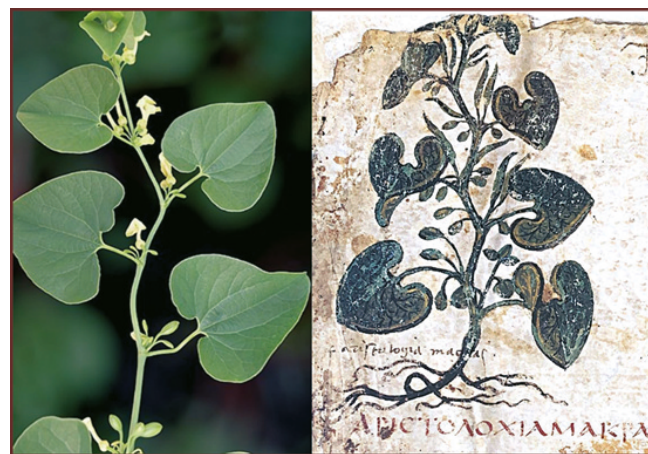


Figure 4. Birthwort (Ἀριστολοχία, Aristolochia clematitis) is proposed by Dioscorides as a cleanser for the gums, [Codex Neapolitanus Grecaeus 1 of the National Library of Naples fol. 1r]

σηπεδόνες], are treated with mouthwash from the sauce of the blotched picarel fish (μενίς=Spicara maena)⁴⁶. Unfortunately, Dioscorides does not make any other mention regarding the appearance or aetiology of pus in the mouth.

Regarding aphthous ulcers, a significant number of remedies can be found in both works. Treatment for ulcers included; henna tree (κύπρος = Lawsonia inermis), thanks to its styptic properties, tribulus (τρίβολος), wild raisin, alum (στυπτηρία), omphacium (ὀμφάκιον) and bramble (βάτος). If bramble leaves were chewed it was thought that this would strengthen the gingiva and heal aphthae, [ἡ βάτος κρατύνει δὲ καὶ οὖλα καὶ ἄφθας ὑγιάζει διαμασσωμένων τῶν φύλλων]⁴⁷. Similarly, omphacium is a juice of unripe psithion or aminnaian grape, which does not belong to any of the modern varieties. When mixed with honey or sweet wine it was thought to counter a variety of ailments. Apart from ulcers, it is claimed it could reduce pus from the gums and inflammation of the tonsil⁴⁸. Of course, the currently most famous herb for tackling ulcers is oregano (ὀρίγανος). It is easily prepared, and is found in many homes. It has anti-inflammatory properties even today is cited in folk herbal medicine books. For the treatment of ulcers, Dioscorides recommends the use of a pabulum of freshly cut oregano⁴⁹.

In “Euporista”, Dioscorides discusses both aphthae and the “nomas” (τὰς ἄφθας καὶ τὰς νομάς), which means gangrenous inflammation of the mucosa. Hence, in the chapter regarding aphthae ulcers Dioscorides states:

“The aphthae and inflammations of the oral mucosa are healed by honey and all these

written above [previously]..... Additionally, though, and especially on this occasion, the following; leaves of wicker or Cypress tree, if rubbed on along with honey, Tribulus juice, the same the juice of Acacia, the same the juice of Cytinus or tanning pomegranate, Omphacion, Oregano, and the same pomegranate used in food; the same and the flower of wild pomegranate if dried and placed on top and its decoction if used as mouthwash, and Sandarac along with Rose oil for mouthwashes, the juice of British herb and the same and the leaves of wild olive tree; one part of arsenic and three parts burnt papyrus to be used dry and with honey; the soup of the blotched Picarel when used as mouthwash, the juice of plantain, Cecis with oil for mouthwash the same the liquid alum”⁵⁰

In chapter 79 of the Wellmann edition related to oral mucosa decays he mentions the following: [τὰς δὲ ἐν τῷ στόματι σηπεδόνας ἴστησιν μὲν καὶ τὰ πρὸς νομὰς ἀναγεγραμμένα, ἰδίως δὲ ταῦτα· μαράθου ἀγρίου ρίζης κεκαυμένης ἢ τέφρα· ἢ μαινίδων κεκαυμένων μέρη β', ἀλόης μέρος α', ξηρά· ἢ ἀρσενικοῦ δ', χάρτου κεκαυμένου ιβ', ξηρά· ἢ σταφίς λεία χωρὶς τῶν γιγάρτων καταπλασθεῖσα, ἀμόργη ἐλαίου ἐψηθεῖσα ἐπιχρισμένη]⁵¹

“the putrid humors in the mouth treat and all these that have been written already for the gangrenous inflammations of the oral mucosa and especially these: the ash of the burnt root of wild fennel; or two parts of burnt blotched Picarel and one part of Aloe Vera, dry; or four drachmae arsenic and twelve drachmae burnt papyrus, dry; or melted raisin without the seeds as plaster; or coating with boiled Amorge”

Drugs for cleaning teeth and halitosis

A final category of medicaments refers to teeth cleaning and mouth fresheners. This is the first time that substances used to clean the teeth have been mentioned in any of Dioscorides works which is a milestone in the history of preventive dentistry. In the Hippocratic texts there exists a rather odd prescription for improving a woman's bad breath, yet we now clearly encounter substances that are appropriate to clean the teeth [ἀρμόζουσι πρὸς σμῆξιν ὀδόντων], such as murex (marine molluscs) (πορφύρα) and trumpet shells (κήρυκες)⁵². Oysters and animal horns were also used for cleaning teeth.

Burnt shells were thought to cure leprosy and clean teeth [δύναται δὲ πάντων τὰ ὄστρακα κεκαυμένα θερμαίνειν καὶ καίειν, σμήχειν λέπρας, ἀλφούς, ὀδόντας]⁵³. Deer horn seems to be important in both Greek and Roman literature of that time. During the Roman Imperial Period authors such as Aulus Cornelius Celsus in his work "De Medicina", Scribonius Largus in his work "Compositiones Medicamentorum", and even Caius Plinius Caecilius Secundus, known as Plinius Senior, in his work "Naturalis Historia", were interested in oral diseases and recorded ways of healing them either through medicaments or surgically. Amongst the drugs that tackled oral conditions many remedies used for teeth cleaning can be found. There is a prescription which uses deer horns as a main ingredient which reveals similarities between Roman and Greek therapies. This demonstrates the influence that the Ancient Greek medical literature had on the evolution of Roman medicine⁵⁴.

Dioscorides specifically recommends rubbing deer horn on teeth as a cleaning agent [καὶ ὀδόντας δὲ παρατριβόμενον σμήχει]⁵⁵. Meanwhile, in "De materia medica" materials of inorganic nature like pumice stone (κίσσηρις) and of organic nature like Alcyonium (ἀλκυόνιον) are used to either clean⁵⁶ or whiten⁵⁷ the teeth. In "Euporista" deer horn, pumice stone, burnt mussels with honey or the burnt shell of cuttlefish are used to clean teeth. Additionally, the root Birthwort (ἀριστολοχία, Table 2) and burnt Arabic stone, crushed and mixed with honey are mentioned. However, the same substances mixed with either Spikenard (στάχυν νάρδου, Nardostachys Jatamansi), Flower of Schoenus (ἀνθὸ σχοίνου, βούρλου) or unwashed burnt hair and melted with the addition of salt were used to obtain a pleasant mouth odour and eliminate bad breath (εὐωδίας χάριν)⁵⁸. Besides the remedies recommended purely for teeth cleaning, there are, according to Dioscorides, drugs which tackle the bad odours of the mouth [τὰς περὶ τὸ στόμα δυσωδίας] such as vinegar flavored with squill (σκιλλητικόν ὄζος)⁵⁹. In "Euporista" the extract of agai wood root (ἀγάλοχος = *Aquilaria malaccensis*) with mouthwashes, myrrh, flower of schinus or cinnamon when chewed and bay leaf (μαλάβαθρον = *Cinnamomum Tamala*) which is placed under the tongue⁶⁰. These treatments, which are described in both works were clearly effective against bad mouth odour in the cases in which oral hygiene was limited. Under no circumstances, though, can we suppose that all these substances had the power to eliminate halitosis, which was a result of some oral

ailment, since obviously the cause of the smell was not treated.

Conclusion

Dioscorides's contribution to dental therapeutics and the value of his works have been immense, especially in our attempt to comprehend the way in which dental practice took place in antiquity. The large number of medicaments available, and the extent of the oral and dental diseases that were treated is astonishing. With the aid of Dioscorides's work on simple drugs and Galen's on complex drugs, we have a much greater understanding of dental practice in the ancient world. From the study of Dioscorides' treatises, we can appreciate the relatively high caliber of Greek dentistry at that time. However, a great number of drugs recommended by Dioscorides would now be considered to be ineffective. Despite this, the work of Dioscorides reveals a higher level of dental knowledge in antiquity than previously suspected.

References

- 1 Rozos V. & Papavasiliou I., *History of Medicine*, Greek Edition, Athens-Ioannina: ZHTA Medical publishing, 1985:201.
- 2 Riddle, John M., "Dioscorides". *Catalogus Translationum et Commentariorum*. IV: 1-143, 1980.
- 3 Galen, *De compositione medicamentorum per genera* (XIII. 857,11 – 13 Kühn).
- 4 Dioscorides, *De Materia Medica* (I. 2,18 – 23 Wellmann).
- 5 Ciancaspro M., Cavallo G. & Touwaide Al., *Dioscurides De materia medica. Codex Neapolitanus Graecus of the National Libray of Naples. Facsimile reproduction of the manuscript with introductory texts*, Athens: Militos Editions, 1999: 13 – 14.
- 6 Dioscorides, *De Materia Medica* (I. 2,23 – 2,4 Wellmann).
- 7 Ibid. (I. 2,16 – 18 Wellmann).
- 8 Ibid. (I. 2,18 – 20 Wellmann).
- 9 Scarborough J. (ed.) *Symposium on Byzantine medicine*, Washington D.C.: Dumbarton Oaks Papers. 1984: 214.
- 10 Dioscorides, *De Materia Medica* (I. 151, 3 – 4 Wellmann).
- 11 Wellmann M. *Pedanii Dioscuridis Anazarbei Euporista vel De simplicibus medicinis*. vol. III. Berlin: Apud Weidmannos. 1906-1914.
- 12 Petry K. *Zahntherapie in den Werken des Pedanios Dioskurides*. PhD Thesis, Leipzig: Universität Leipzig. 1920:6.
- 13 Touwaide Al. «Heras of Kappadokia». In: Keyser P. T. & Irby-Massie G. L. (eds.) *Encyclopedia of Ancient Natural Scientists: The Greek Tradition and its Many Heirs*. London and New York: Routledge. 2006: 175-198.
- 14 Dioscorides, *De Materia Medica* (I. 28, 8 – 17 Wellmann).
- 15 Ibid. (V. 72,8 – 9 Wellmann).
- 16 Ibid. (II. 248,2 – 4 Wellmann).
- 17 Ibid. (I. 77,4 – 6 Wellmann).
- 18 Ibid. (II. 200,9 – 10 Wellmann).
- 19 Ibid. (III. 36,11 – 12 Wellmann).
- 20 Ibid. (IV. 259,8 Wellmann).
- 21 Ibid. (IV. 311,4-5 Wellmann).
- 22 Ibid. (II. 243,4-5 Wellmann).
- 23 Ibid. (I. 82, 16 Wellmann).
- 24 Ibid. (I. 93, 7-9 Wellmann).
- 25 Ibid. (III. 20, 8-9 Wellmann).
- 26 L. Y. Beck (tr.), *Pedanius Dioscorides of Anazarbus: De materia medica* (Altertumswissenschaftliche Texte und Studien, vol. 38), Hildesheim-Zurich-New York: Olms-Weidmann, 2005.
- 27 Ibid. (IV. 227, 2-3 Wellmann).
- 28 Koutroumpas D., *Ancient Dentistry*, Research Monograph, Athens: University of Athens, 2016: 106 – 109.
- 29 Dioscorides, *De Materia Medica* (II. 141, 15-17 Wellmann).
- 30 Ibid. (II. 127, 11-13 Wellmann).
- 31 Ibid. (II. 131, 1-2 Wellmann).
- 32 Rife L. J., *Isthmia IX: the Roman and Byzantine Graves and Human Remains*, Princeton: American School of Classical Studies at Athens. 2012: 334 – 351.
- 33 Dioscorides, *De Materia Medica* (V. 17, 12-14 Wellmann).
- 34 Ibid. (I. 104, 13-16 Wellmann).
- 35 Ibid. (I. 97, 5 - 99,7 Wellmann).
- 36 Ibid. (V. 76, 15 - 21 Wellmann).
- 37 Ibid. (V. 72, 7 - 9 Wellmann).
- 38 Ibid. (V. 79, 7 - 8 Wellmann).
- 39 Ibid. (V. 80, 16 - 17 Wellmann).
- 40 Koutroumpas D., *Ancient Dentistry*, Research Monograph, Athens: University of Athens, 2016: 161.
- 41 Dioscorides, *De Materia Medica* (V. 46, 12 – 17 Wellmann).
- 42 Ibid. (I. 106, 14 - 15 Wellmann).
- 43 Ibid. (IV. 181, 8 - 10 Wellmann).
- 44 Ibid. (IV. 297, 10 – 298,1 Wellmann).
- 45 Ibid. (V. 23, 3 - 4 Wellmann).
- 46 Ibid. (II. 131, 14 - 15 Wellmann).
- 47 Ibid. (IV. 197, 1 - 2 Wellmann).
- 48 Ibid. (V. 5, 4 - 5 Wellmann).
- 49 Ibid. (III. 38, 7 - 8 Wellmann).
- 50 Dioscorides, *De Simplicibus Medicinis* (I. 181, 18 – 182,5 Wellmann).
- 51 Ibid. (I. 182,6 – 11 Wellmann).
- 52 Dioscorides, *De Materia Medica* (II. 122, 10 - 16 Wellmann).
- 53 Ibid. (II. 124, 20 - 21 Wellmann).
- 54 Lentini R., *Dentifrici e Igiene Orale nel Mondo Romano, Medicina nel Secoli Arte e Scienza*. 1995; 7: 351-365.
- 55 Dioscorides, *De Materia Medica* (II. 139, 11 - 12 Wellmann).
- 56 Ibid. (V. 79, 10 Wellmann).
- 57 Ibid. (V. 88, 7 Wellmann).
- 58 Dioscorides, *De Simplicibus Medicinis* (I. 179,19 – 180,4

Wellmann).

59 Dioscorides, *De Materia Medica* (V. 17, 14 Wellmann).

60 Dioscorides, *De Simplicibus Medicinis* (I. 182,12 – 15 Wellmann).

Authors biographies:

Dimitrios Koutroumpas: BA in History and Philosophy of the Sciences, University of Athens; MA in Historical Research, Middlesex University; DDS from the Dental School, University of Athens; PhD in History of Medicine from the Medical School, University of Athens, Postdoctoral Researcher in the Dental School, University of Athens.

Evangelia Lioumi: DDS from the Dental School, University of Athens, PhD in Operative Dentistry from the Dental School, University of Athens

Hermione Konstantina Koutroumpas: First year student, Faculty of Chemistry, University of Athens

Address for correspondence:

DKoutroumpas@gmail.com