

Μαστίχα Χίου

Chios Mastiha^{PDO}
Medical and Scientific Reports

chiosmastiha
VOYAGE TO THE EAST MEDITERRANEAN

Chios Mastiha, a PDO product

On 1992 the European Union enacted 2081/92 regulation (substituted by 510/2006) for the protection of the designation of origin of the agricultural products.

“ Protected designation of origin – PDO “ is the name of a specific region or in extraordinary cases the name of a country, which is used in the description of an agricultural product or a food originating from this specified location or country. The quality or the characteristics of the above are mainly or exclusively due to the geographical environment, including the natural and human factors and the production, alteration and process which take place in the delimited geographical area.

Since 1997, Chios mastiha has been identified as **Protected Designation of Origin product (PDO)**, subject to No.123/1997 Regulation (L0224/24-1-97) of European Union and has been registered in the relevant community list of the PDO products.

All protected designation of origin products bear the PDO mark. 

The PDO designation, for the agricultural products and food, allows to the growers to promote more easily these products and on the other hand it allows to the consumers to buy quality products, the production, process and origination of which are guaranteed.

The registered names for the PDO products are protected against any direct or indirect commercial use of other products which do not comply with the special specifications (of the PDO products), as well as against any expropriation, imitation, insinuation, false or deceitful indication as far as it concerns the origin, derivation or nature of the product. Moreover, the registered names protect the products against any other practice able to misinform the public on the actual origin of the product.

Apart from the PDO products European Union has enacted PGI (Protected Geographical Indication) and TSG (Traditional Speciality Guaranteed) products. More specifically:

“Protected Geographical Indication – PGI “ is the name of a specific region or in extraordinary cases the name of a country, which is used in the description of an agricultural product or a food originating from this specified location or country. The quality, fame or other characteristic of the above is due to this geographical origin and the production and / or alteration and /or process of which take place in the delimited geographical area.

“Traditional Speciality Guaranteed Products – TSG “ are the alteration products which are characterized by their composition or their mode of preparation. The composition and the mode of preparation of these products have not been changed for ages and integrate the history , the customs and the tradition of the people who produce such products. They are based on the tradition and the alimentary culture of the European citizens while they bear and present those special characteristics which are due to the soil-climatic conditions of the cultivation area and to the special production and alteration conditions.



Overview of the Scientific Publications on the Beneficial Properties of Natural Chios Mastiha

Introduction

Chios mastiha: A tear that gladdens, scents, comforts, cures!

If there was a registered trademark for the island of Chios, that would certainly be the mastiha tree, this unique gift of the nature, that often in the past had been the apple of discord between the powerful men of each time.

The mastiha tree is evergreen, it belongs to Anacardiaceae family, gender Pistacia lentiscus L. and it grows mainly on the coasts of the eastern basin of the Mediterranean Sea. From the specific family, only Pistacia Lentiscus var. Chia variety, systematically cultivated in the south part of the island of Chios, produces the choice Mastiha, unique for its therapeutic properties. The combination of the variety of the tree, the soil, the microclimate, the topology and the relief of the region, constitute the “secret” for the exclusivity that characterizes this small nook of our planet.

Chios Mastiha is the resinous excretion of the mastiha tree. The natural and aromatic resin is excreted in the form of tears from the trunk and the large branches, through cuts on the surface made by means of sharp pointed tools. It remains under the shrub until it solidifies, for 20 days approximately, depending on the weather conditions in the area during summer time (determining factors are the sunlight and the humidity rate of the environment). The solidified product is Chios Mastiha, which is collected, divided into categories depending on the size of the granule. The mastiha producers wash it up and clean it, before turning it over to the local collective of every village which then forwards it to the Chios Mastiha Growers Association.

The exact composition of the Chios Mastiha is not known yet. This unique resin consists of an excellent variety of therapeutic and aromatic ingredients. More specifically, it consists of the following ingredients: natural polymer, volatile and aromatic ingredients that constitute the essential oil, mastic oil, terpenic acids, phytosterols, polyphenolic molecules and a large number of other drastic ingredients, some of which are found in nature for the first time. This combination of more than 80 ingredients justifies the multiple uses of Chios Mastiha, not only in the food but also in the health & personal care sector, on a worldwide scale.

Chios Mastiha was recognized in ancient times as much for its distinctive flavor as for its therapeutic properties. Documents show that it was the first natural chewing gum of the ancient world, used to clean the teeth and freshen the breath. It was even used in cosmetology for cleansing the face and body Chios Mastiha was used as an active ingredient in a series



Chios Mastiha. The tear that gladdens

of pharmaceutical formulas and nostrums, many of which have been recorded from time to time in international pharmacopeias.

Dioscorides (1st century P. C.) physician and botanist from Cilicia, is considered to be “the father of pharmacology” and he had classified medicines in 5 categories. His book “on medical material” was not surpassed earlier than 16th century. Dioscorides praises the therapeutic properties of Chios Mastiha, mentioning that it helps in the cases of indigestion, in the blood reproduction, in chronic coughing, while at the same time it acts as tranquilizer. Moreover, he ascertains that the chewing of Mastiha apart from oral hygiene contributes to clean and fresh breath. At another point he mentions mastiha oil, the essential oil of mastiha, which used to be applied in multiple ways for affections of the uterus, as mild heating, styptic and lenitive means.

In general, from the 1st until the 7th century PC. Mastiha was used by medical practitioners and botanists mainly for the treatment of stomach disorders. In the view of the people at that time, the use of mastiha contributed to the smooth operation of the gastric and intestinal system. More specifically and from the various sources results that the Mastiha was used for soothing the pain of the stomach as well as indigestion and stomach disorders (Oribasius, Aetius, Galen, Pilen).

In the years that followed, many medical practitioners, pharmacist and botanists of the time make reference to the therapeutic properties of the mastiha, which they used in order to produce therapeutic formulas, preparations and nostrums. The use of Mastiha continued to spread successfully during Byzantine times. During medieval times, mastiha trade in the European Continent flourished mainly due to the medical-pharmaceutical applications. In many European Pharmacopeias of 16th – 18th century PC. (in books containing and cross-checking a multitude of knowledge from pharmacist of the time) comprehensive references are made to the beneficial action of mastiha in many disorders of human organism.

In our time, the scientific community, albeit belatedly but with sound, scientific methodology, has come to corroborate and document the therapeutic actions of Chios Mastiha. It has now been scientifically proven that Chios Mastiha displays beneficial action against digestive disorders, contributes to oral hygiene, displays significant antimicrobial and anti-inflammatory action, is a natural antioxidant, and also aids in trauma healing and skin regeneration. Today, a series of reports in international medical journals corroborate the historically recorded properties of Chios Mastiha. These bulletins are based on the results of laboratory studies as well as on clinical trials carried out by independent researchers in Greece and abroad, and have revealed that Chios Mastiha possesses unique beneficial and therapeutic properties.

In the pages that follow, a brief reference is made to the most important research studies, on the medical-pharmaceutical action of Chios Mastiha, the findings of which have been published in international scientific magazines.



Chios Mastiha. The mastiha-yielding tree shed its tears only on the island of Chios.

Antimicrobial Action of the Chios Mastiha essential oil (Mastiha oil)

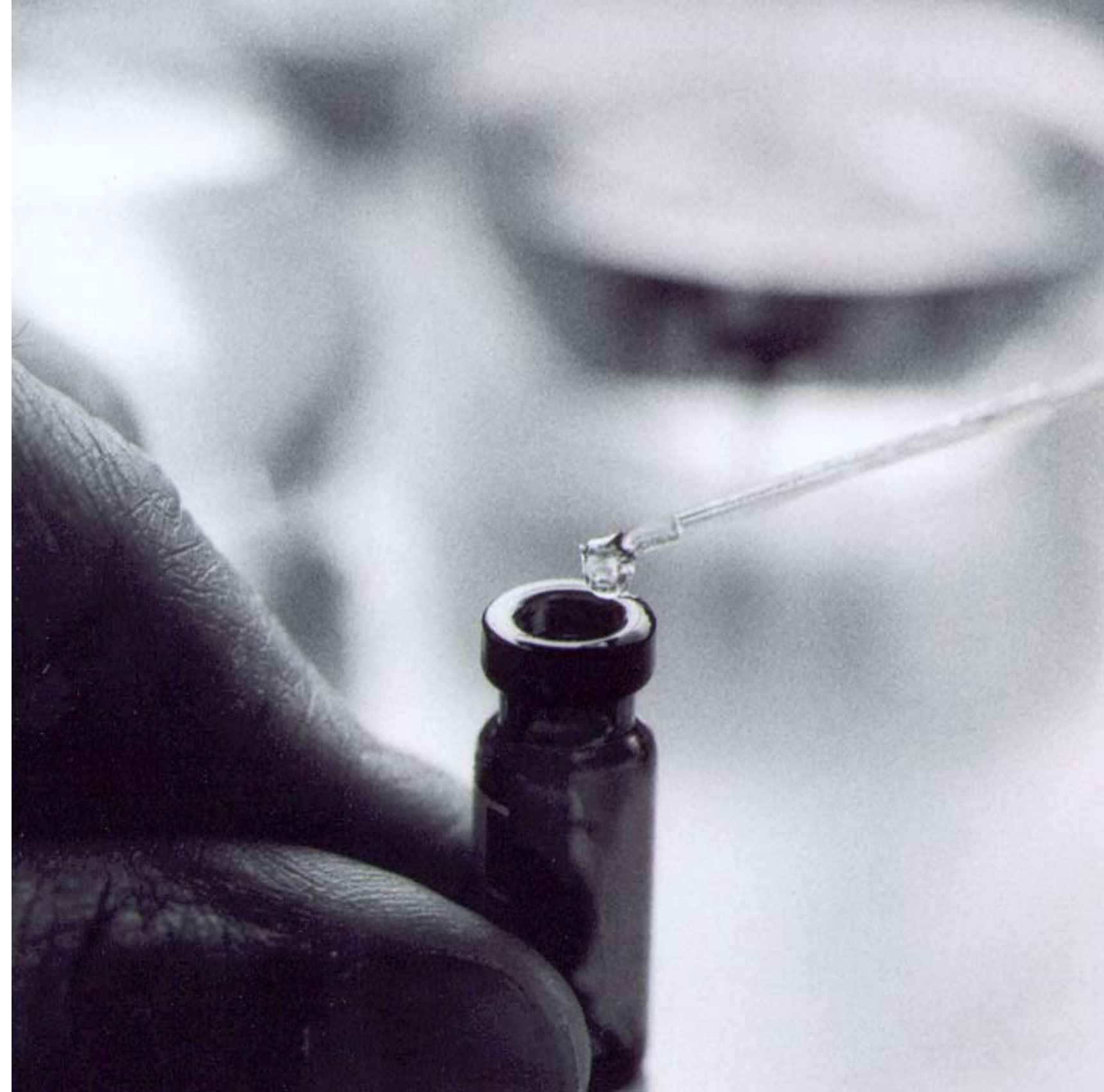
An important research activity has been conducted on the antimicrobial action of the essential oil of Mastiha – Mastiha oil. Studies mainly consist of the in-vitro (artificial environment) action of the oil against Gram positive (+) and Gram negative (-) bacteria, as well as in other pathogenic microorganisms, such as fungi. In the studies that have been conducted, the limitation of proliferation rate is examined as well as the extermination of microbes, bacteria and pathogenic microorganisms, when mastiha oil - essential oil of Chios Mastiha has been added in the development substrates. The findings of the studies, confirm the important antimicrobial and antimycotic action of mastic oil, a fact that encourages its utilization, as ingredient of pharmaceutical and other preparations, for protection and care.

More specifically, a study that has been published in the International *Biodeterioration & Biodegradation* review by C. Tassou, & G. Nychas⁽¹⁾ shows the effectiveness of mastiha oil in substrates of pathogenic microorganisms and bacteria, such as: *Staphylococcus aureus*, *Lactobacillus plantarum*, *Pseudomonas fragi* and *Salmonella enteritidis*. The presence of mastiha oil in the substrate, has been found to effectively prohibit the development of microorganisms, while in many cases a fast extermination of the population has been ascertained.

A similar study⁽²⁾ that has been conducted by the Pharmaceutical Faculty of the University of Athens, confirms the anti-bacterial action of the essential oil of Chios Mastiha against Gram positive (+) and Gram negative (-) bacteria, such as: *Staphylococcus aureus*, *Staphylococcus epidermidis* *Escherichia coli* etc, as well as against pathogenic fungi. The antimicrobial action of mastiha oil is related to the high concentration in alpha-pinene, which has been found to have a strong antimicrobial action.

A similar publication of the Microbiology Institute of the University of Catania in Italy⁽³⁾, presents very interesting findings on the antimicrobial/antibacterial extracts of Mastiha with organic solvents, in bacteria such as (*Sarcina lutea*, *Staphylococcus aureus*, and *Escherichia coli*) as well as in fungi (*Candida albicans*, *Candida parapsilosis*, *Torulopsis glabrata* and *Cryptococcus neoformans*).

Besides, a recent study⁽⁴⁾ (year 2004) conducted by the Faculty of Food Science & Agricultural Chemistry in Quebec, Canada, and published in *International Journal of Food Microbiology* review has reached the very interesting conclusion that Chios Mastiha and mainly its essential oil (mastiha oil), can effectively be used as factors against the appearance of botox in nutrition substrates. More specifically, the results of the laboratory tests show that the addition of mastiha oil in the minimum concentration of 0.3% etc, is sufficient for suspending the development of *Clostridium botulinum*, which is responsible for the appearance of botox. The study reaches the conclusion that Chios Mastiha and its mastic oil, could potentially be used as natural preservatives in baked goods.



Finally, a study conducted in 2005 by the University of Warwick in Coventry, England⁽⁵⁾, confirms the important antimicrobial action of the Chios Mastiha oil in pathogenic bacteria such as: Escherichia coli, Staphylococcus aureus, and Bacillus subtilis. The most important conclusion of the study is the fact that the antimicrobial action of the mastiha oil, is not due to some specific ingredient, but also to the unique combination of the secondary ingredients of which it consists. More specifically, in the laboratory studies that have been conducted, it has been found out that the antimicrobial action of the mastiha oil is expressly more powerful compared to the action of the independent ingredients of which it consists, which means that it is the result of the synergetic action among the more than fifty ingredients of which it consists.

Published studies:

1. "Antimicrobial Activity of the Essential Oil of Mastiha Gum (Pistacia lentiscus var. chia) on Gram Positive and Gram Negative Bacteria in Broth and in Model Food System", Chrysoula C. Tassou and G. J. E. Nychas, *International Biodeterioration & Biodegradation* (1995), 36, 3-4, p.411.
2. "Chemical composition and antimicrobial activity of the essential oils of Pistacia lentiscus var. chia", Magiatis, P; Melliou, E; Skaltsounis, A L; Chinou, I B; Mitaku, S, *Planta Medica* (1999), 65, 8, p. 749.
3. "In vitro antimicrobial activity of Pistacia Lentiscus L. extracts" Iauk L, Ragusa S, Rapisarda A, Franco S, Nicolosi VM. *Journal of Chemotherapy* (1996), 8, 207-209.
4. "Effects of mastiha resin and its essential oil on the growth of proteolytic Clostridium botulinum" Daphne Phillips Daifas, James P. Smit, Burke Blanchfield, Greg Sanders, John W. Austin and John Koukoutsis, *Int. J. of Food Microb. Vol. 94 2004, Pages 313-22*
5. "Chemical composition and antibacterial activity of the essential oil and the gum of Pistacia lentiscus Var. chia", Koutsoudaki C, Krsek M, Rodger A, *J Agric Food Chem. 2005 Oct 5; 53(20), Pages 7681-5*



Chios Mastiha. One of the wonders
that nature is still offering

Chios Mastiha as protection factor against atherosclerosis

Today, the scientific interest in natural antioxidants, as protection factors against atherosclerosis, is especially intense. These are substances which due to their composition they play a protective role against the formulation of atheromatic plates and thus they protect against atherosclerosis disorders and heart diseases. The presence of phenolic molecules, of titerpenic unions as well as phytosterols in Chios Mastiha, is very important, as these ingredients act against the oxidation of Low Density Lipoprotein (LDL) and this constitutes an important evidence for the potential antioxidant action.

Within this interest, a number of studies have been carried out that show the important protective action of phenolic extract of Chios Mastiha, against the oxidation of LDL, that contributes largely to the appearance of atherosclerosis. The research activity in this field is still in an experimental phase, since till now the protective action of the phenolic extract of the mastiha, has only been studied in vitro, which means in an artificial environment. The findings that have been published till today are especially encouraging and recommend the potential use of mastiha as natural antioxidant.

More specifically, the laboratory research ^(6,7) of G. V. Z. Dedoussis et al. That was published in 2004 in Atherosclerosis magazine, and examines the effect of the total polar extract in the survival of peripheral blood mononuclear cells (PBMC), under oxidant stress conditions, which is created by the oxidized low-density lipoprotein (oxLDL). During the experimental study, the exposition of cells in the oxidized form of LDL, has led to the fast apoptosis and necrosis of the aforementioned cells. The presence, however, of the polar extract of Chios Mastiha has produced an important suspension of the aforementioned phenomena, limiting considerably the cytotoxicity of the oxidized LDL. The results of the specific study constitute important evidence, that Chios Mastiha is a new important antioxidant and antiatherogenic factor for the areas of the Mediterranean.

In 2003, in Phytotherapy Research magazine, a laboratory study ⁽⁸⁾ has been published, conducted by N. Andrikopoulos, A. Kaliora, A. Assimopoulou & V. Papapeorgiou, in which the protective action of natural resins and natural gums has been studied in vitro against the limitation of the oxidation of low-density lipoprotein (LDL). For this purpose, in the under question samples of human LDL it has been artificially oxidized using copper ions and then the presence of extracts of Chios Mastiha has in the containment of oxidation, been evaluated. The results of the tests have led to the conclusion that Chios Mastiha (*Pistacia lentiscus* var. Chia) was the most effective natural product of all those that have been examined (*P. terebinthus* resin, dammar resin, acacia gum, tragacanth gum, storax gum) in the protection against the oxidation of human LDL. Comparatively, the protective action of Chios Mastiha has reached the percentage of 99.9%, which means overall suppression of the



oxidation of LDL, while for the remaining products the protective action has been between 27.0% and 78.8%.

Finally, in another laboratory study⁹⁾, that was published in 2002 in the Italian Journal of Food Science magazine, the aforementioned research team, has examined the biological action of the saliva coming from the chewing of natural Chios Mastiha, but also the chewing of commercial gums (with synthetic perfumes and artificial antioxidant BHT) in the suspension of oxidation procedure of low-density lipoprotein (oxLDL). The results have led to the conclusion that the best protective action against in vitro oxidation of LDL, are produced by the saliva that comes from the natural Chios Mastiha. Its protective action was slightly higher even than the respective action of vitamine E, that was used as a basis for comparative reasons.

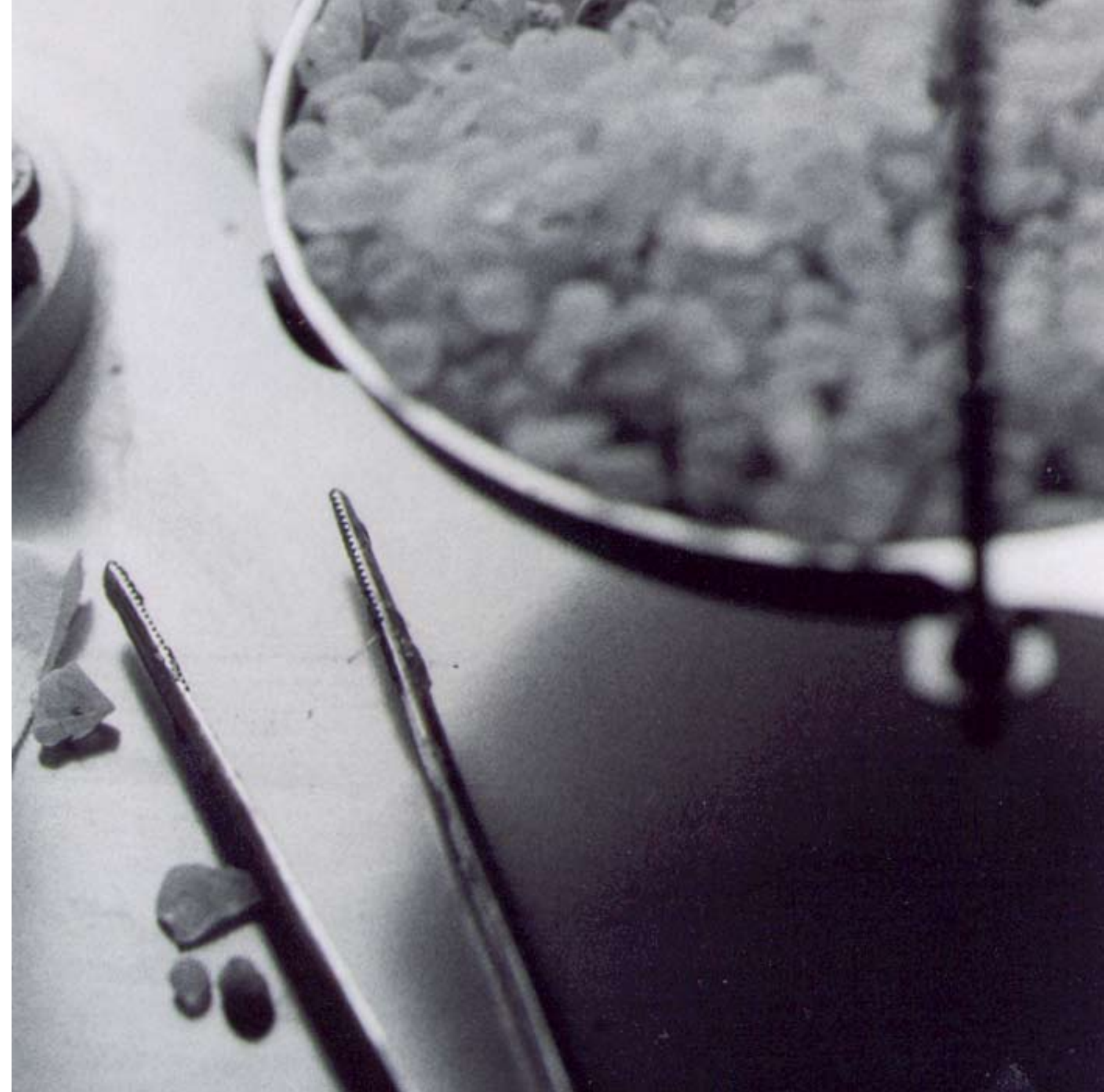
Published studies:

6. “Antiatherogenic effect of Pistacia lentiscus via GSH restoration and downregulation of CD36 mRNA expression” G. V. Z. Dedoussis, A.C. Kaliora, S. Psarras, A. Chiou, A. Mylona, N.G. Papadopoulos, N. K. Andrikopoulos, *Atherosclerosis* 174 (2004) 293–303

7. “Η Μαστίχα Χίου αναστέλλει την απόπτωση μονοπύρηνων κυττάρων περιφερικού αίματος σε συνθήκες οξειδωτικού στρες”, A. Kaliora, G. Dedousis, N. Andrikopoulos, *Minutes of the 3rd Panhellenic Meeting on Free Radicals and Oxidant Stress*, Athens, October 3-5, 2002.

8. “Biological activity of saliva against in vitro LDL oxidation after chewing commercial chewing gums” N. Andrikopoulos, A. Kaliora, A. Assimopoulou, V. Papageorgiou. *Ital. J. Food Sci.* (2002), 3, Vol.14, p. 279-290

9. “Biological activity of some naturally occurring resins, gums and pigments against in vitro LDL oxidation” N. Andrikopoulos, A. Kaliora, A. Assimopoulou, V. Papageorgiou. *Phytotherapy Research* Vol. 17, (5), 2003, Page 501-507.



Chios mastiha in oral hygiene and dental research

As far as it concerns the traditional use of Chios Mastiha, university studies present its special advantages during the study of chewing procedure, and its use in dealing with dental and oral problems. Chios Mastiha is being used for many years, as the ideal material for studying the procedure of chewing, as its texture changes slowly and hence the chewing rate can be precisely defined. This fact helps in selecting the appropriate treatment plan for treating dental-oral problems.

Relevant studies⁽¹⁰⁻¹³⁾, have shown that the chewing of Chios Mastiha, effectively contributes to massaging and exercising the gums, with all the beneficial results for the health of the teeth and the gums in general. At the same time, it has been established⁽¹⁴⁾ that Chios Mastiha as opposed to common chewing gums, due to its distinguishable taste and its relevant hardness, results in producing larger amounts of saliva, leading to the enhancement of the feeling of freshness and cleanness of the mouth, while at the same time it contributes to the calmative treatment of xerostomia, a frequent phenomenon especially in elderly people.

In combination with the above, a number of studies have been conducted as well as clinical researches that concern the action of mastiha and mastiha chewing gum in limiting the formation of microbial plates as well as in suspending the bacterial development in buccal cavity.

A relevant clinical study^(15, 16), that was conducted in the dental faculty of the University of Thessaloniki in 1985, has demonstrated that if Chios Mastiha is used systematically, it may result in important decrease in the amount of formatting or already formatted dental plaque. For the conducting of the study, ten volunteer students with low caries rate were divided in two groups the first of which chewed Chios Mastiha for ten days, while the second chewed a placebo chewing gum. The results of the study have confirmed that in the group that used mastiha the amount of microbial plaque was largely diminished, and hence it can be used effectively in the prevention of caries, periodental disorders and buccal cavity diseases in general.

A similar clinical study^(17, 18), that was published in 2003 in Journal of Periodontology magazine, conducted by Dental Faculty of the University of Meikai in Japan, has examined the action of chewing gum with natural Chios Mastiha against the bacteria of saliva and the buccal cavity in general. For this purpose 20 orally healthy volunteers have participated, who were divided in two groups. The first group used Chios Mastiha, while the second one used a placebo gum. In the saliva that was concentrated, before and after the chewing, the total number of bacterial colonies have been identified and compared. At the same time, before and after the systematic chewing for 7 days, in the two groups the level of gingivitis – dental plaque as well as gum irritation degree – has been studied. The results led to the conclu-

Chios Mastiha. Hard effort and solicitude,
care and tradition are required,
combined together so as for the tear
to become a sugarplum.

sion that Chios Mastiha leads to suspension of bacterial development in the buccal cavity, responsible for causing periodontal diseases as well as the formation of dental plaque. At the same time, Chios Mastiha has led to a significantly lower degree of gum irritation, in comparison with placebo gum, confirming that it constitutes a drastic and safe means for improving oral hygiene.

Besides, a contemporary study⁽¹⁹⁾, conducted by the dental Faculty of Ege University, in Izmir and published in Journal of Clinical Pediatric Dentistry magazine in 2004, has studied the action of three types of chewing gums (a. gum with sugar, b. gum in combination with xylitol and sorbitol, as well as natural mastiha) in restoring normal pH values in the dental plaque after artificial oxidation. The results have shown that the use of gum with polyols, increases the plaque pH, but the chewing of natural mastiha leads to the expressly higher values of pH, restoring the values to the normal levels.

Very recently (2005), researchers from three universities of Turkey have published in Archive of Oral Biology magazine⁽²⁰⁾ a study that investigates the in vitro, as well as in vivo action of mastiha against pathogenic bacteria of streptococcus mutans family, which constitute one of the most basic reasons for the appearance of the carries and diseases of the buccal cavity in general. For the laboratory study of the antimicrobial action of mastiha (in vitro) model streptococcus mutans samples have been used. Respectively, the clinical study has been applied in 25 periodontally healthy volunteers, who were divided in two groups: the first group consisted of those who used mastiha and the second of those who used placebo gum for comparative reasons. The appraisal of the effectiveness of mastic in limiting streptococcus mutans development, has been conducted by comparing samples of saliva that were taken from the two groups of volunteers before and after 15, 45, 75, 105 and 135 minutes from the moment they started chewing the mastiha and the placebo gum. In each of the aforementioned five intervals it was discovered that in the saliva samples of the volunteers of mastiha group there was an important, gradual decrease (15 minutes: 37%, 45 minutes:48.5%, 75 minutes:56.7%, 105 minutes:62.7%) of the total population of bacteria that reached 62.1 % after 135 minutes of chewing. On the contrary, in the case of placebo gum group, there was no type of containment of the bacteria population. In the conclusions of the study it is established that mastic presents an exceptionally interesting antibacterial action, which in the case of streptococcus mutans it can be compared to the action of antibiotics (vancomycin). This action of mastiha appears as especially important, as it concerns the limitation of the frequent and dangerous bacteria of the mouth: streptococcus mutans, which are responsible for the decalcification of the enamel of the teeth, also responsible for a number of surface diseases of the denture. The results of the study reach the conclusion that the frequent use of mastiha constitutes an important factor (natural chewing gum) in improving oral hygiene, always in combination with the frequent teeth brushing.



Chew and benefit.

Published studies:

10. "Chewing, the fundamental reflex action, offering pleasure and the contribution of Mastiha to its study" M.R. Heath, B. Αναστασιάδου, Minutes of International Symposium: "Chios Mastiha, Tradition and Modern practices", Chios, October 3-5 1997, p.39.
11. "The effect of the natural characteristics of Mastiha on the types of chewing", V. Anastasiadou, M.R. Heath, Minutes of International Symposium: "Chian Mastic, Tradition and Modern practices", Chios, October 3-5 1997, p.49.
12. Chios Mastiha: A potential means in dealing with dental problems", S. Kiliaridis, Minutes of International Symposium: "Chios Mastiha, Tradition and Modern practices", Chios, October 3-5 1997, p.67.
13. "Study of the Viscosity – Elasticity Properties of Various Types of Mastiha After Chewing from Persons of Different Age with Different Dental Conditions", V. Anastasiadou Stomatology (2002), 59(1), p.39-49
14. "Evaluation of xerostomy degree in elderly patients with entire dentures", V. Anastasiadou, Mouth Magazine (2002),30
15. "Chios Mastiha and oral hygiene. I: A possible measure for decrease microbial plaque formation" Topitsoglou-Themeli V, Dangalis P, Lambrou D, Hell. Stom. Chron. (1984), Vol.28, p. 166-170.
16. "Chios Mastiha and oral hygiene. II: Differentiation in microbial plaque formation" Topitsoglou-Themeli V, Kolokotronis A, Dangalis P, Lambrou D Pedodontia (1985), Vol. 2, p. 56-59.
17. "Mastiha gum Inhibits Bacterial Grow in Oral Cavity", Munemoto Fukazawa, Keiso Takahashi, Kazuyuki Watanabe, Hitoshi Motohira, Shigeru Amano, Kuniyasu Ochiai and Takashi Miyata, Journal of the Japanese Society of Periodontology (2001), Vol. 43, Issue 13(4) p. 86.
18. "A Pilot Study on Anti-Plaque Effects of Mastiha Chewing Gum in Oral Cavity", Keiso Takahashi, Munemoto Fukazawa, Keiso Watanabe, Kuniyasu Ochiai Hirofumi Nishikawa and Takashi Miyata, Journal of Periodontology (2003), Vol. 7, No. 4 p. 507-511.
19. "Effect of chewing gum on plaque acidogenicity" Koparal E, Ertugrul F, Sabah E. Journal of Clinical Pediatric Dentistry Vol. 24(2) Page 129-32
20. "In vitro and in vivo antimicrobial effects of mastiha chewing gum against Streptococcus mutans and mutans streptococci" Aksoy A, Duran N, Koksall F, Archives of Oral Biology 2005 Dec 15.



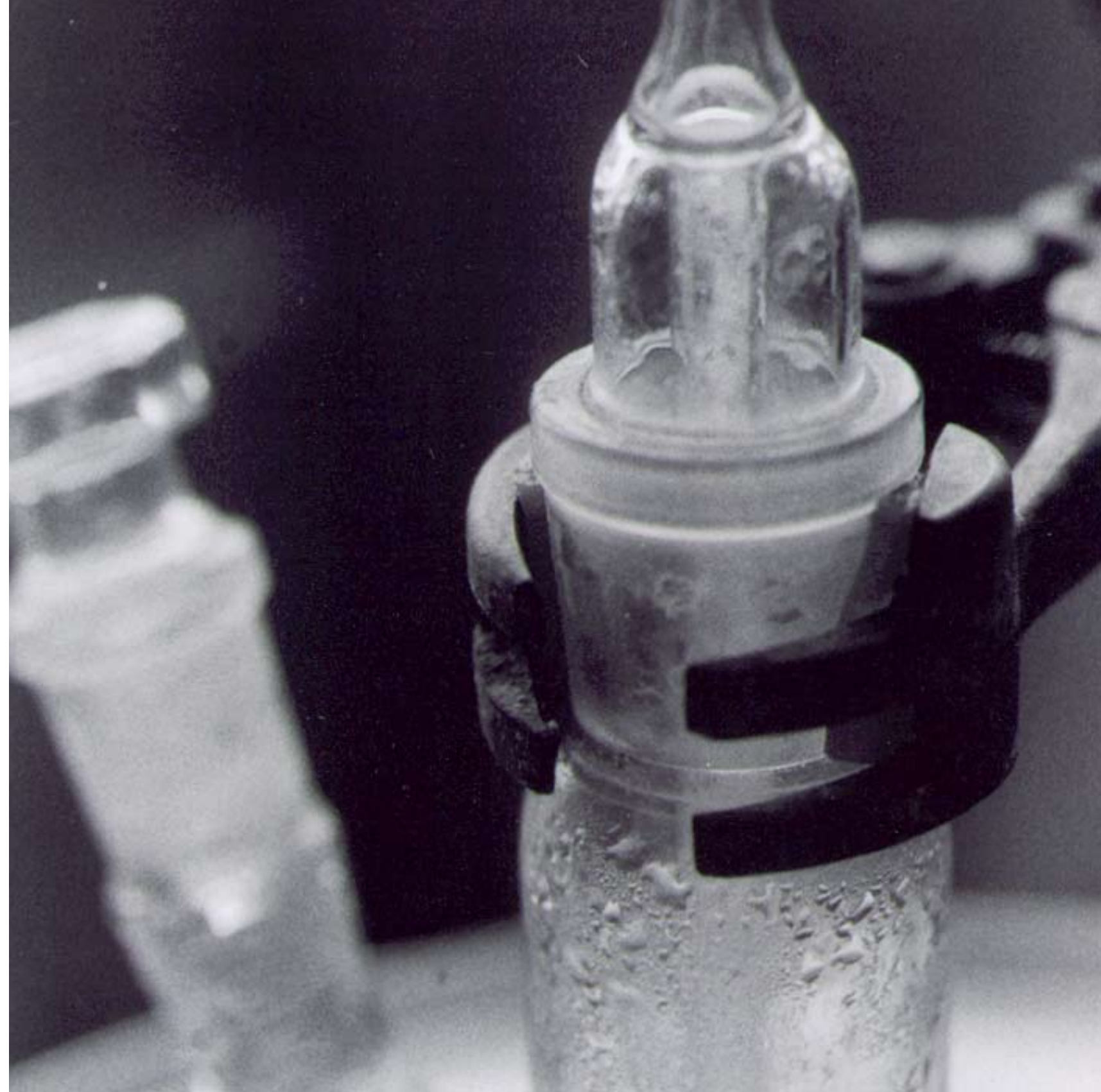
The action of Mastiha in the prevention and treatment of digestive system disorders

Of special interest are the results of modern scientific studies, that relate to the therapeutic action of mastiha in digestive system disorders. Already from ancient years it was known that Chios Mastiha constituted a drastic ingredient for soothing the pain of stomach, e.g., gastric disorders, indigestion problems, gastralgia, as well as digestive ulcers. Written references from physicians of the time, practitioners and botanists, as well as references in pharmaceuticals of the ancient and medieval times recommend Chios Mastiha as a beneficial means for the diseases and disorders of gastro-intestinal system. In our time, scientific, laboratory studies as well as clinical researches, come to confirm the above important action of Chios Mastiha.

The first research efforts have been made in university institutions and clinics of the Arab world, in areas where the use of Chios Mastiha is especially spread even in nostrums and formulas of practical medicine.

The first clinical study^(21, 22), published in 1984 in *Clinical & Experimental Pharmacology & Physiology* magazine was conducted by Al-Habbal MJ, Al-Habbal Z, Huwez FU in the university clinic of Mosul University in Iraq. In this study 38 volunteers participated. These volunteers had symptoms, and endoscopic confirmation of duodenal ulcer. For the comparison of the effectiveness of Chios Mastiha, the volunteers were divided in two groups: in those that consumed Chios Mastiha for two weeks (1 gram per day) and those that consumed the same dosage of placebo powder (lactose) for the same time period. After the lapse of two weeks all the volunteers were endoscopically examined, in order to see the progress of the ulcer. The results showed that in the group that consumed mastiha there was an alleviation of the symptoms in 80% of the cases, while the endoscopic examination has confirmed that duodenal ulcer was cured in 70% of the cases. The conclusions of the clinical study recommend mastiha as drastic element for the alleviation and the treatment of ulcer symptoms. Another important conclusion of the research was that the use of Chios Mastiha produced no unwanted side-effect.

The same research team has published⁽²³⁾ in 1986 in the *Gastroenterologia Japonica* magazine the findings of a new clinical study in patients who suffered of gastric ulcers, of benign nature. For this purpose, to six patients to whom gastric ulcer was diagnosed by means of gastroscopy, Chios Mastiha was administered in the dosage of 2 grams per day for four weeks (1 gram before breakfast and 1 gram before sleeping at night). No patient was administered another type of pharmaceutical treatment, for a time period of at least two months before the initiation of the clinical study. For the evaluation of the action of mastiha gastroscopies were conducted as well as routine laboratory controls in the blood, urine, and other biochemical parameters, before the initiation of the treatment, two weeks after, four weeks



after and two months after the initiation of mastiha administration. The results of the study have shown that the administration of mastiha has relieved all six patients that participated in the search from the symptoms, while the treatment was even endoscopically confirmed in five of them. During the study, but also two months after its completion no type of unwanted effect was found, nor any unusual result in the laboratory analysis.

In the same year (1986) in Journal of Ethnopharmacology magazine a study⁽²⁴⁾ was published by Mansoor S. Al-Said et al., in guinea-pigs (mice), which was conducted in order to evaluate the effectiveness of mastiha against gastric ulcer and duodenal ulcer. For this purpose, with the use of the appropriate chemicals ulcer was formed in the stomach of the mice. Afterwards, through their food, mastiha was administered to them in the proportion of 500mg per guinea-pig kilo. The results of the study have shown that the administration of Chios Mastiha has produced an important decrease in the expansion and intensity of the formed ulcer in the gastric membrane of the guinea-pigs, suggesting that it can be used as treatment means of the locally formed ulcer.

In 1998, a study⁽²⁵⁾ that was published in the famous magazine New England Journal of Medicine, by the University Hospital of Nottingham in England, has reached the conclusion that Chios Mastiha has a decidedly proven action against HP. Note that the title of the publications is especially characteristic: "Mastiha Gum Kills Helicobacter pylori". The study shows the findings that suggest that even 1 gram of mastiha per day, for a time period of two weeks may cure digestive ulcer. This beneficial action, is due to the fact that mastiha exterminates Helicobacter pylori which is liable for the majority of the digestive ulcer cases. Note that Helicobacter pylori is responsible for 75% of digestive ulcer cases, while the respective amount in the case of duodenal ulcer amounts to 90%. In the specific study fresh samples were used with the presence of Helicobacter pylori, which were isolated from patients and the minimum bactericidal concentration (MBC) of mastiha was searched, which means the minimum concentration required in order to exterminate 99.9% of the bacterium within 24 hours. Mastiha exterminated the bacterium in all the examined samples, regardless of the size of the population. The minimum bacterial concentration (MBC) of mastiha was 60 µg/ml, but even in smaller concentrations, the antibacterial action was especially important.

In 2001 announcements^(26, 27) by Serafino G. Bona et al. Published in The American Journal of Gastroenterology, and Journal of Chemotherapy magazines come to confirm the effectiveness of mastiha against helicobacter pylori. For this purpose clinical samples were used with the presence of HP, which were isolated from patients and the Minimal Bactericidal Concentration (MBC) of mastiha extraction was searched. The results showed that the mastiha in concentration of 125 µg/ml killed the helicobacter in 50% of the examined samples, while concentration 500 µg/ml has exterminated the helicobacter in 90% of the samples. At the same time, in all the samples that were studied morphological changes have been identified in the bacterium after the use of electronic microscope. The results of the study,



Chios Mastiha, The absolute chewing and buccal cavity hygiene product.

are in absolute harmony with the ones of the above researchers and they reach the conclusion that the Mastiha has an especially good action against HP.

In another study⁽²⁸⁾ conducted in the Medical Microbiology Laboratory of the Greek Pasteur Institute, on May 2002, it is established that the administration of Chios Mastiha in guinea-pigs (mice), that were infected with helicobacter pylori, resulted in a substantial decrease of the immigration degree of the bacterium, while there was no record of important decrease in the degree and the activity of the accompanying gastritis.

Respectively, in 2002 in South Korea Society of Gastroenterology magazine a clinical study⁽²⁹⁾ has been published. The study had been conducted by the Medical School of Dan-kook University in South Korea, concerning the action of mastiha against gastritis caused by Helicobacter pylori (HP). For this purpose 48 volunteers participated, and it was discovered that they were infected by the helicobacter, with the use of UBT - UREA BREATH TEST technique: breath test for detecting HP. The participants were divided in two groups the first of which used Chios Mastiha chewing gum for 90 days, while the second one used placebo gum. The UBT test was applied on patients before the initiation of the study as well as in intervals of 30 and 90 days following the completion. The results of the tests have shown that the use of mastiha is especially effective in limiting the concentration of helicobacter pylori as well as the gastritis due also to helicobacter pylori, reaching the conclusion that it can be used as an additional means for containing the bacterium and its effects.

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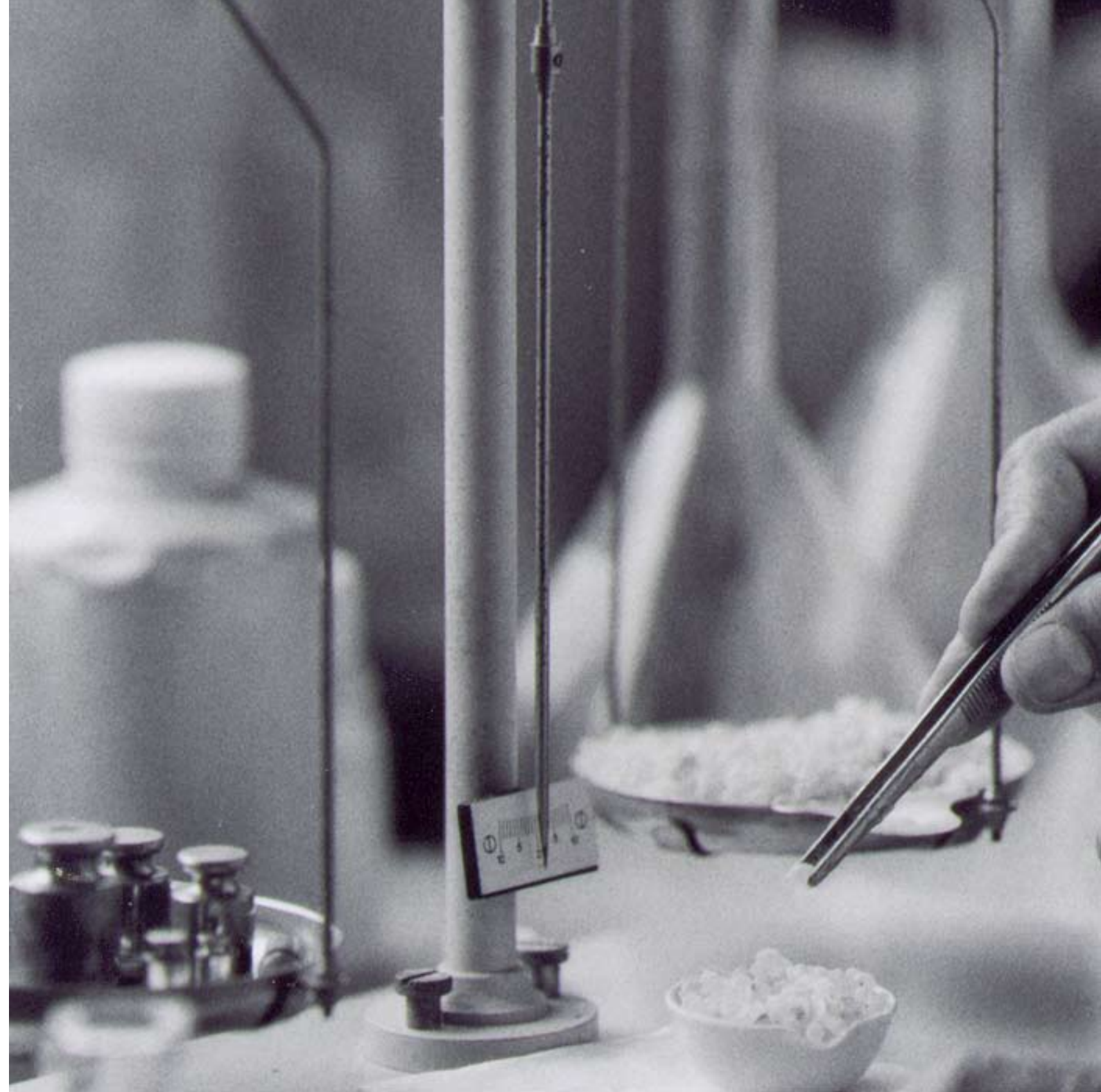
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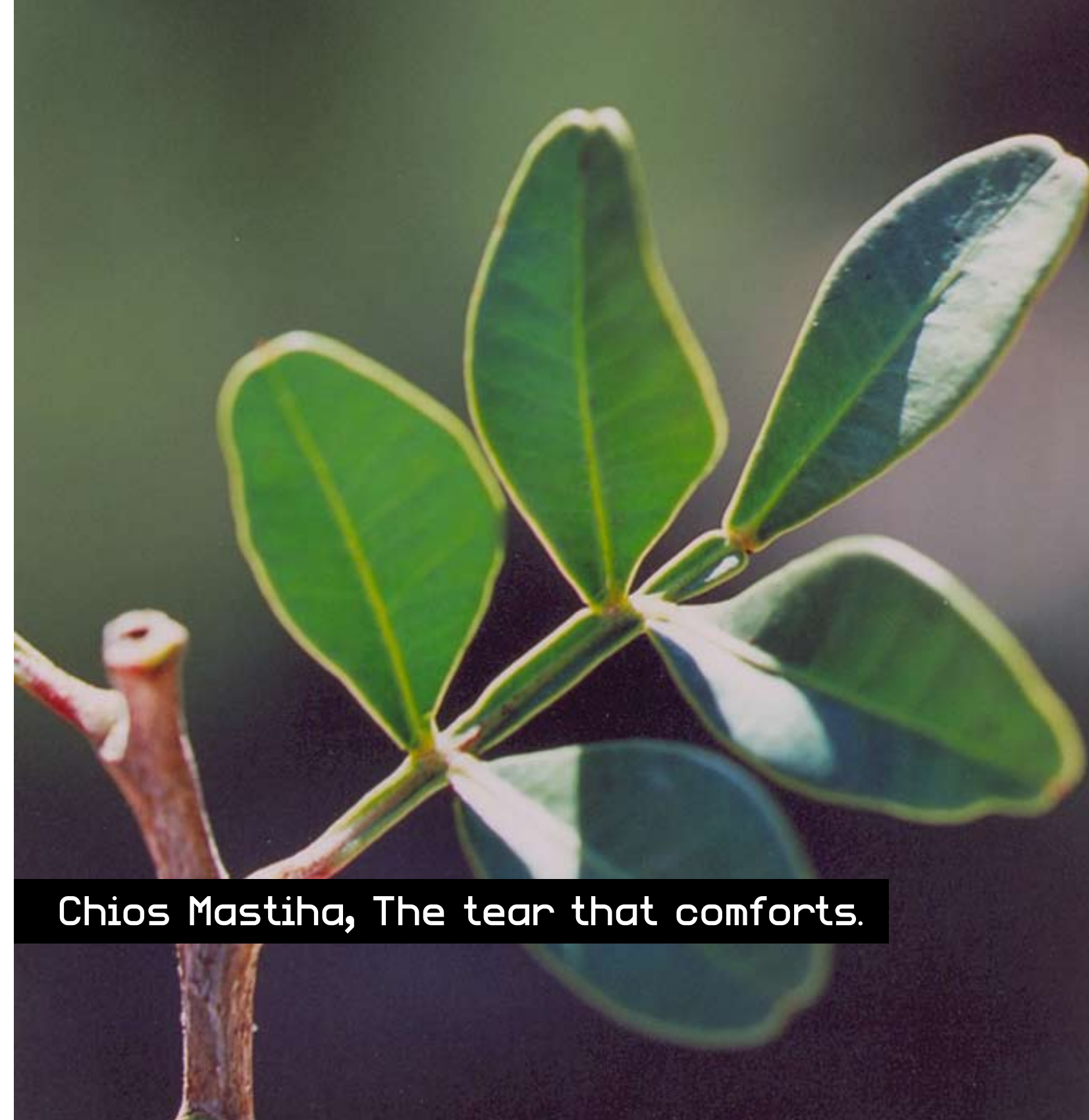


The use of Mastiha as an ingredient in wound healing plasters and as anaplastic factor of the skin

The exceptional adhesive properties of Chios Mastiha, as well as its beneficial presence in healing wounds and post-operative incisions have been identified and studied by researchers for at least twenty years now. Already, this unique natural resin is used very often as ingredient in bandages, plasters, compresses and other healing means, applied in the protection and healing of wounds or postoperative incisions. The results of relevant publications show, that Chios Mastiha presents exceptional adhesive properties, when used in covering means and wound and incisions healing means, while at the same time, it contributes to the effective regeneration of the skin and to the wound healing, while it does not have undesirable side-effects on the skin (irritation, itching, dermatitis, skin depigmentation, etc), as the conventional ingredients used in healing means.

Already since 1986 in a relevant study^(30, 31) that was published in The Journal of Dermatologic Surgery and Oncology magazine, a comparison is made of the adhesive properties of three categories of bandages. In the first category the adhesive bandages did not contain any additional ingredient, in the second category the bandages contained additionally the widely used ingredient for such applications: bezoin, USP and in the third category Chios Mastiha solution was used as reinforcing means. The specific study has shown that despite the use of bezoin, USP in the bandages has resulted in improving their adhesive properties, the use of mastic has brought an even more impressive improvement, confirming that Chios Mastiha can be used with great success in the specific application.

In a relevant study⁽³²⁾ published in 1992, in The Journal of Dermatologic Surgery and Oncology magazine, a comparison is made between the adhesive properties, as well as of the unwanted effects of mastiha as ingredient of the adhesive bandages, and bezoin, USP. The study has been applied to 300 volunteers (100 men and 200 women), who were submitted to plastic surgeries. The volunteers were divided in two groups: In the first group adhesive bandages with bezoin, USP were applied, while in the second group bandages with Chios Mastiha ingredient were used. The volunteers were examined postoperatively after a period of 6 days, 1, 3, 6 and 12 months. The evaluation was based on elements such as : The attentive study of the condition of the wound, the appearance of infections, the effluence of the wound, the depigmentation and irritation of the skin, as well as the premature loss of the adhesive properties of the bandage. The findings of the specific study have reached the conclusion that Chios Mastiha, not only does it offer exceptional adhesive properties to the healing means, as compared to bezoin, USP, but also it has an advantage over this latter one, in that it has exceptionally lower possibility of problems to arise due to dermatitis, and irritation or depigmentation of the skin. The results of the specific study were confirmed in a relevant announcement⁽³³⁾ of 2005, by another research team, as published in The American Journal of Surgery magazine and reaches the conclusion that mastiha substantially



Chios Mastiha, The tear that comforts.

increases the adhesive action of the self-adhesive bandages, when these are used as the only means for covering wounds and incisions.

Finally, in a relevant study⁽³⁴⁾ conducted in the Cellular Proliferation and Ageing Laboratory of the Biology Institute of EKEFE “Demokritus”, very interesting findings were presented. The said findings prove that Chios Mastiha and its extractions, present notable healing properties, contributing at the same time to the effective regeneration of the skin and the composition of collagen. This fact is considered to be very important, if we take into account that the composition of collagen is the most important parameter of the tissue cicatrization.

Published studies:

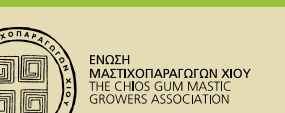
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