LICHENS IN THE PRESCRIPTIONS OF PLINY THE ELDER

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Abstract. Caius Plinius Secundus, better known as Pliny the Elder, was a Roman author, naturalist, commander and a contemporary of Pedanius Dioscorides. He wrote an encyclopaedic work, **Naturalis Historiae**, consisting of thirty-seven books. In this study, two Latin codices and an English translation of **Naturalis Historiae** have been cross-compared and evaluated in order to investigate medicinal uses of lichens (the fungo-algal symbiotic organisms) in the antiquity. It is found that, Caius Plinius Secundus prescribes some botanical herbs -probably lichens- as remedies of dermatological diseases.

Keywords: Plinius, ethnomedicine, lichens, Naturalis Historiae, remedy.

Rezumat. Lichenii în prescripţiile lui Pliniu Cel Bătrân. Caius Plinius Secundus, mai bine cunoscut sub numele de Pliniu cel Bătrân, a fost un autor roman, naturalist, comandant şi un contemporan al lui Dioscoride Pedanius. El a scris o enciclopedie **Naturalis Historiae**, constând în treizeci şi şapte cărţi. În acest studiu, două codice în limba latină şi traducerea în limba engleză a **Naturalis Historiae** au fost confruntate şi evaluate în scopul de a investiga utilizarea medicamentelor din licheni (organisme simbiotice fungo-algale) în antichitate. Se constată că, Caius Plinius Secundus prescrie unele remedii naturiste din plante medicinale - probabil licheni - pentru boli dermatologice.

Cuvinte cheie: Plinius, etnomedicină, licheni, Naturalis Historiae, remedii.

INTRODUCTION

Caius Plinius Secundus (23-79 AD), better known as Pliny the Elder, was a Roman author, naturalist, and natural philosopher, as well as naval and army commander of the early Roman Empire. He was contemporary of Pedanius Dioscorides (40-90 AD) and personal friend of the emperor Vespasian. He died on August 25th, 79 AD, while attempting the rescue by ship of a friend and his family from the eruption of Mount Vesuvius that had just destroyed the cities of Pompeii and Herculaneum (Web 01). Spending most of his spare time studying, writing or investigating natural and geographic phenomena in the field, he wrote an encyclopaedic work, "**Naturalis Historiae**", 77-79 AD consisting of thirty-seven books, which became a model for all such works written subsequently (Web 02).

Lichens are by definition symbiotic organisms, usually composed of a fungal partner, the mycobiont and one or more photosynthetic partners, the photobiont, which is most often either a green alga or a cyanobacterium (NASH, 2008). There are three major morphological kinds of thalli, namely crustose, foliose and fruticose. Crustose types adhere closely to their substrates, foliose thalli are leafy and attach more loosely, while fruticose thalli may be pendulous strands of hollow upright stalks (AHMADJIAN, 1993). According to the substrates, where they grow on, lichens are considered in three divisions as saxicolous, terricolous and epiphytic. Currently, lichens are included in the classification system of fungi under Ascomycota (NASH, 2008). Lichens have been used in medicine, pharmacy and industry from antiquity to present day in the treatment of various diseases like alopecia, arthritis, constipation, infection, kidney diseases, leprosy, pharyngitis rabies, worm and infestation (RICHARDSON, 1991; MALHOTRA et al., 2008).

Lichens produce a wide range of bioactive secondary metabolites, referred to as "Lichen Substances", which exert a wide variety of biological actions including analgesic, antibiotic, anti-inflammatory, antimicrobial, antimycobacterial, antiproliferative, antipyretic, antitumor, antiviral, cytotoxic and immunomodulator effects (HUNECK & YOSHIMURA, 1996; MÜLLER, 2002; MALHOTRA et al., 2008). The word *Lichen* is derived from the Greek word *λεικην (Leikhen)- Leprous* and refers to the use of lichens in treating skin diseases due to their peeling-skin appearance (COBANOĞLU & YAVUZ, 2003; MALHOTRA et al., 2008). In this study, Pliny the Elder has been investigated and evaluated in terms of use of lichens in medicinal prescriptions.

METHODS

In this study, a number of documents, digital resources, two Latin codices (PORTILIA, 1481; MAYHOFF, 1906) and an English translation (BOSTOCK & RILEY, 1855) of Naturalis Historiae have been cross-compared and evaluated in order to investigate medicinal uses of lichens in the antiquity. Relevant biochemical data from the literature on lichens are given in order to provide knowledge prior to lichens' uses in the history of medicine from antiquity to the present day.

RESULTS

It is found in Naturalis Historiae that, Caius Plinius Secundus prescribes some botanical herbs - probably lichens - as drugs in Book XXVI Major Medicinal Herbs, chapter 10 "The Lichen", as remedy of a skin disease called *Lichen* or *Lichenas* (Lichen planus, the tetter or eruption on skin) and in Book XXVII Minor Medicinal Herbs chapter

75. “Stone Moss”, as remedy of a contagious bacterial skin infection called *impetigo*. It must be taken into consideration that, the number of books or chapters may differ among several translations or codices of Naturalis Historiae.

XXVI.10: *Sed in lichenis remediis atque tam foedo malo plura undique acervabimus, quamquam non paucis iam demonstratis. Medetur ergo plantago trita, quinquefolium, radix albuci ex aceto, ficulni caules ex aceto decocti, hibisci radix cum glutino et aceto acri decocta ad quartas. Defricant etiam pumice, et rumicis radix trita ex aceto illinitur et flos visci cum calce subactus laudatur et tithymalli cum resina decoctum.*

Lichen vero herba omnibus suis praefertur, inde nomine invento. Nascitur in saxis, folio uno ad radicem lato, caule uno parvo, longis foliis dependentibus. Haec delet et stigmata. Teritur cum melle. Est aliud genus lichenis, petris totum adhaerens ut muscus, qui et ipse inlinitur. Hic et sanguinem sistit volneribus instillatus et collectiones inlitus. Morbum quoque regium cum melle sanat ore inlito et lingua. Qui ita curentur, aqua salsa lavari iubentur, ungui oleo amygdalino, hortensiis abstinere. Ad lichenas et thapsiae radice utuntur trita cum melle.

English Translation **XXVI.10:** But for the treatment of tetter, as it is both ugly and even more a bad disease, here is a number of additional remedies we amassed, although I have already described. Heals, and then pounded *Plantago* sp., *Potentilla* sp., root of *Asphodelus albus* WILLD. in vinegar, the young stems of *Ficus* sp. tree boiled in vinegar, roots of *Althaea officinalis* L. with glue, hard vinegar boiled down to one-fourth. The sores are rubbed with pumice, and then fomented with root of *Rumex acetosa* L. bruised in vinegar, or with flowers of *Viscum album* L. kneaded up with lime, a decoction of *Euphorbia characias* L. with resin is highly esteemed for the same purpose.

Lichen is the herb preferred to all, since the name is found. It grows among rocks, and has a single broad leaf near the root, a single long stem, with long leaves hanging down. This deletes the marks (when) pounded with honey. There is another kind of lichen also adhering to the rocks so much, like moss, which is applied. Dropt into wounds, or applied to abscesses, has the property of arresting haemorrhage. Mixed with honey, it is curative of jaundice, the face and tongue being rubbed with it. Under this mode of treatment, the patient is recommended to wash in salt water, to anoint himself / herself with oil of *Amygdalus communis* L., and to abstain from garden vegetables. For the cure of tetter, root of *Thapsia garganica* L. is also used, bruised in honey.

XXVII.75: *Lapis vulgaris iuxta flumina fert muscum siccum, canum. Hic fricatur altero lapide addita hominis saliva; illo lapide tangitur inpetigo. Qui tangit, dicit: φεύγετε κανθαρίδες, λύκος άγριος αίμα διώχνει.*

English Translation **XXVII.75:** There (it) grows near running streams, a dry, white moss, upon ordinary stones. One of these stones, with the addition of human saliva, is rubbed against another; after which the first stone is used for touching impetigo, the party so doing uttering these words: *“Pheugete kantharides lukos agrios aima diokhnei - Cantharides begone, a wild wolf seeks your blood”.*

DISCUSSIONS

A previous article investigates uses of lichens in Dioscorides’ De Materia Medica (YAVUZ, 2012). This paper is modestly focused on Lichens mentioned by Plinius. After a study on Latin codices and the English translation of Naturalis Historiae, it is found that Plinius mentions about some herbs “Lichens” - in chapter XXVI.10 - which are classified as “Lichenized Fungi” under the Kingdom Fungi in today’s botanical taxonomy (NASH, 2008). In this chapter, in order to cure tetter, Plinius first mentions *Marchantia polymorpha* L. species with this description: *“has a single broad leaf near the root, a single long stem, with long leaves hanging down”*. In as much as lichens lack of parts or organs named “roots”, “stems” or “leaves”, this herb is supposed to be a species of liverworts. Plinius mentions a second kind of lichen with the description: *”adhering to the rocks so much, like mosses”*. This phrase is the basic definition of saxicolous-crustose lichens growing with the mosses. In chapter XXVI.10, Plinius prescribes that this kind of lichen *”is dropt into wounds”, ”applied to abscesses”, ”has the property of arresting haemorrhage”* and *”is curative of jaundice”*.

In chapter XXVII.75, Plinius mentions a *”dry”* and *”white”* moss upon *”ordinary stones”*, *”near streams”*. Lichens can easily grow under humid microclimate effects in rocky habitats and since they have a wide range of thallus colour, one may describe them white, gray, black, yellow, orange, green, brown, etc. In this chapter, Plinius prescribes that lichens *“cure impetigo*” after rubbing with stones with the addition of human saliva. He also states an interesting expression of a ritual or spell: *“Cantharides begone, a wild wolf seeks your blood”*.

ROMAGNI & DAYAN (2002) report a number of studies pertaining to the isolation, characterization, potential biological activities and / or uses of lichen extracts. In another excellent study, COCCHIETTO et al. (2002) review physiological aspects of usnic acid, which is one of the most common and abundant lichen metabolites. Medicinal uses of Usnea mentioned in Liber Almansoris (Kitab el Mansuri), the famous work of Rhazes (854-925 AD) was reported by YAVUZ & ÇOBANOĞLU (2010).

This paper is an attempt to elucidate medicinal uses of lichens mentioned in Naturalis Historiae. Below Plinius’ prescriptions are given with potential uses, lichen metabolites, the genus / species derived and the reference cited (Table 1).

Dropt into wounds & applied to abscesses: MARX (2001) states that several lichen metabolites like atranorin, boninic, diffractaic, gyrophoric, lobaric, obstusatic, sekikaic and thamnolic acids exhibited interesting activity as inhibitors of leukotriene biosynthesis. Repression of leukotrienes has beneficial anti-inflammatory effects. ROMAGNI &

DAYAN (2002) report alectoronic, galbinic, leprarinic and protocetraric acids also show analgesic and anti-inflammatory effects. The analgesic and antipyretic effects of usnic acid (and diffractaic acid) were evaluated in orally treated mice by OKUYAMA et al. (1995); usnic acid was effective against acetic acid-induced writhing. The anti-inflammatory activity tests of usnic acid indicate a dose-dependent, significant effectiveness comparable to that of the standard reference drug ibuprofen.

Hypothetically, one can indicate that, lichens of Plinius showed anti-inflammatory and analgesic effects due to lichen acids mentioned above, thus he prescribed lichens to drop into wounds and apply on abscesses.

Table 1: Uses of Lichens and Lichen Metabolites.

Prescription	***Potential use***	***Lichen Metabolite***	***Genus / Species***	***Reference***
Dropt into wounds & Applied to abscesses	Analgesic, Anti-inflammatory	Atranorin	Many species	MARX (2001)
		Alectoronic Acid	*Alectoria* spp.	ROMAGNI & DAYAN (2002)
			Cetrelia spp.	
			Parmelia spp.	
		Boninic Acid	*Ramalina boninensis*	MARX (2001)
		Diffractaic Acid	*Parmelia* spp.,	
			Usnea spp.	
		Galbinic Acid	*Parmelia* spp.	ROMAGNI & DAYAN (2002)
		Gyrophoric Acid	Many species	MARX (2001)
			Rinodia orcina	
		Leprarinic Acid	*Lecidea lurida*	ROMAGNI & DAYAN (2002)
			Lepraria citrina	
		Lobaric Acid	Many species	MARX (2001)
		Obstusatic Acid	*Ramalina* spp.	
		Protocetraric Acid	*Parmelia* spp.	ROMAGNI & DAYAN (2002)
			Usnea spp.	
		Sekikaic Acid	*Anzia* spp.	MARX (2001)
			Ramalina spp.	
		Thamnolic Acid	*Cladonia* spp.	
			Thamnolia spp.	
		Usnic Acid	*Alectoria* spp.	ROMAGNI & DAYAN (2002)
			Cetraria spp.	
			Cladonia spp.,	
			Parmelia spp.	
			Usnea spp.	
Arresting haemorrhage	hyphal texture of thallus		Common	YAVUZ (2012)
Curative of jaundice	Doctrine of Signatures	Parietinic Acid	*Xanthoria parietina*	LLANO (1950)
Tongue rubbed with	Oral treatments, Toothpaste	Usnic Acid	*Alectoria* spp.	FERRARI et al. (1988), COCCHIETTO et al. (2002), ROMAGNI & DAYAN (2002)
			Cetraria spp.	
			Cladonia spp.,	
			Parmelia spp.	
			Usnea spp.	
Face rubbed with & Cures impetigo	Acne protection & Antibacterial agent	Usnic Acid	*Alectoria* spp.	ROMAGNI & DAYAN (2002)
			Cetraria spp.	
			Cladonia spp.,	
			Parmelia spp.	
			Usnea spp.	
	Dermatology	Sitosterol	*Lecanora dispersa*	
	Hair & Skin care	Calycin	*Sticta* spp.	
		Pulvinic acid		

Arresting haemorrhage: In the relevant literature of modern biology and medicine, there is not any reference to cite about lichens used to stop haemorrhage. However, as mentioned in YAVUZ (2012) study, lichens have a hyphal texture of thallus like a fibrous network, which may show an anti-haemorrhage property when applied on wounds.

Curative of jaundice: Almost every known culture has employed naturally occurring substances: animals, plants, and minerals as medicines to treat symptoms, ward off diseases, or bring physic to particular body organs. The guiding principle was that the substance used be linked to the symptoms of ailment by some shared aspect of similarity or resemblance, usually in terms of colour, shape, behaviour, or appellation. The second principle was the use of a substance that might produce symptoms of a particular disease in a healthy person to remedy those same symptoms in one who is sick (LEV, 2002). The union of these principles was so called **Doctrine of Signatures**. LLANO (1950) reported excellent samples of orange-yellowish lichen *Xanthoria parietina* - due to its colour - have been used to treat jaundice in traditional medicine from antiquity till today. There is not any biochemical evidence to support uses of lichens against jaundice.

Tongue rubbed with: *Usnea* spp. find use for mild inflammation of the oral and pharyngeal mucosa (MALHOTRA et al., 2008). Preliminary trials on human volunteers using a toothpaste containing usnic acid showed the suitability for the prevention of plaque and caries formation via inhibiting growth of *Streptococcus mutans*, the primary

pathogenic microorganism causing dental and oral diseases (FERRARI et al., 1988). COCCHIETTO et al., 2002 mention oral care-oriented commercial preparations containing usnic acid, on the market. Usnic acid containing species of *Alectoria, Cladonia* and *Cetraria* are reported to be used in toothpastes (ROMAGNI & DAYAN, 2002).

Face rubbed with & cures impetigo: There is much evidence from natural medicine that lichen derivatives are suitable for topical treatment against a large number of skin lesions and affections e.g.: wounds, sores, blisters, infections, furunculosis, burns and scalds (COCCHIETTO et al., 2002). Usnic acid containing *Alectoria* spp., *Cetraria stacheyi* are reported to be effective of acne protection, sitosterol producing *Lecanora dispersa* is used in cosmetics and dermatology, while calycin and pulvinic acid releasing *Sticta* spp. are consumed in hair and skin care. Recently, facial acne control creams containing lichen antibacterial agents such as Usnic Acid or Lichesterinic Acid have been developed (ROMAGNI & DAYAN, 2002). Usnic acid has been used throughout Europe as an antibacterial cream sold under the names of "Usno" and "Evosin" (ROMAGNI & DAYAN, 2002). Along the same lines, other lichen products have been used by the cosmetic industry. For example, sterols such as ergosterol and its derivatives though not unique to lichens, have been shown to stimulate the proliferation of skin cells (LUBRANO et al., 1999).

CONCLUSION

Uses of lichens are linked with history of ethno-medicine. Ethno-medicinal use of lichens can be traced back to antiquity. For instances, LLANO (1950) reports that *Pseudevernia furfuracea* has been found in an Egyptian vase from the eighteenth dynasty and was used to preserve the odour of spices employed in embalming mummies where LAUNERT (1981) states the same species was used as a drug in the period of the same dynasty. It is obvious that Plinius prescribes in his medicinal recipes and denotes "lichens" growing among mosses on rocks (saxicolous thalli) since he mentions the mosses as separate chapters in XII.50 Sphagnos and in XXIV.17 Sphagnos or Bryon. Thus, it is assumed that Plinius had mentioned true lichens in his prescriptions although there are not enough morphological statements so that one could taxonomically identify the lichen species mentioned in Naturalis Historiae.

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