

# Caelius Aurelianus (5<sup>th</sup> century AD) study on Worms

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## SUMMARY

Caelius Aurelianus (5<sup>th</sup> century AD) translated in Latin the work of Soranus of Ephesus (2<sup>nd</sup> half of 1<sup>st</sup> century - 1<sup>st</sup> quarter of 2<sup>nd</sup> century AD) *On Acute and on Chronic Diseases*. In this Latin translation, the 8<sup>th</sup> chapter of the fourth book of chronic diseases is devoted in worm's infection in children and in adults. This study is the most complete and comprehensive analysis of this special infection of the Greek and Roman antiquity. In this chapter, the physician examined in great detail the semiology, differential diagnosis and treatment of such

an infection. In addition, there are saved the views of many other ancient Greek physicians whose original text now are lost. Although the study of Caelius Aurelianus was based on the original Greek text of Soranus of Ephesus it should not be denied that Caelius Aurelianus made his own additions and arranged the text in a more accurate and organized manner.

*Keywords:* Caelius Aurelianus, Soranus of Ephesus, Hippocrates, Worms, Olive Oil.

## INTRODUCTION

Caelius Aurelianus (5<sup>th</sup> century AD) in the 8<sup>th</sup> chapter of the fourth book of chronic diseases of his study *On Acute and on Chronic Diseases (De morbis acutis et chronicis)*, which is a Latin translation of Soranus of Ephesus (2<sup>nd</sup> half of 1<sup>st</sup> century - 1<sup>st</sup> quarter of 2<sup>nd</sup> century AD) lost study written in Greek entitled *On Acute and on Chronic Diseases*, gave us a thorough study on worms infection [1-3]. In this study, one can find a detailed analysis considering the semiology, differential diagnosis and treatment of such an infection. In addition, this study is of great value because there are saved the views on the theme of many other ancient Greek physicians, many of them are lost in their original texts.

### Semiology

Caelius Aurelianus described the symptoms in adults and in children in a case of worms' infection. He underlined that worms' infection in gener-

al can be presented with severe or mild symptoms affecting or not the strength of the patient, with or without fever. Regarding the corporal symptoms in these conditions, the physician wrote about the looseness of the bowels as a major symptom without the expulsion of worms and the intestinal cramps, twisting pains and tenderness in the intestines or the stomach which are always present. He noticed that many times the patients lost their appetite, felt weak, had a pallor in their faces and were emaciated. The physician also focused on the loss of logic which could be seen in this disease and the seizures presented by the patients in severe cases, in which also convulsion, arrhythmia, aphonia, fever and death can occur. Special symptoms were described when this type of infection appeared in children. The physician noticed sometimes in children infected a restless movement of parts of the body when the child is sleeping, accompanied by sighing, tossing and gnashing the teeth. The child could lie in an unusual position and could cry without reason. In case of a massive discharge of worms in children, the physician was able to palpate a mass. (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.884-885, 106.1-108.3). Caelius Aurelianus wrote also about the character-

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istics of the discharge of worms. The expulsion of worms mainly was seen through the bowels, but also could happen through the mouth and esophagus or nostrils. Worms could be expelled dead or alive, in a sphere mass or one by one. They could be covered with blood or bile and when expelled by the bowels they could be covered with feces or with a yellowish fluid. The color of the worms could be white or yellow (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases*. pp.885-887, 108.4-109.5).

Furthermore, the physician believed that the presence of worms as a special disease or their appearance during another pathology was a sign of decomposition and each physician should be alert except in case of lientery (in ancient medicine the pathological condition in which the food passed through the bowels undigested, was described as lientery), where the presence of worms was interpreted as a good sign probably because there was the conviction that worms helped the patient to manage the undigested food [2]. Nevertheless, Caelius Aurelianus had the impression that worms full of blood were a sign of weakness, while he thought that whitish worms were nourished by the food eaten by the patient and worms foul of blood by blood that was drained from the bowels of the patient. In addition, he had the idea that the expulsion of worms during high fever was a sign of a disturbance of the inner organs even more if worms were full of blood, while their expulsion during low fever was considered as a sign of relaxation of the body (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.890-891, 115.8-117.2).

#### *Differential diagnosis*

Caelius Aurelianus was also interested in the differential diagnosis of the symptoms in a case of an infection of worms. He focused a lot on the lack of logic presented in this condition, which was common in the various mental diseases as they were considered in antiquity such as mania, phrenitis, lethargy, hysterical suffocation, apoplexy, epilepsy, and catalepsy [4-9].

Although he did not examine all the mental diseases in his text as it is saved today - there is the possibility that a portion of the text is lost - he pointed that worm infection should be differentiated from epilepsy because the patients did not foam [10]. In a case of hysterical suffocation an ascent of the uterus was diagnosed by ancient phy-

sicians, which did not happen in worms' infection, while hysterical suffocation was diagnosed only in adult women [7]. He also distinguished worms' infection from catalepsy, underlining that in catalepsy the presence of fever and the large and strong pulse of the patient help for its diagnosis, which did not appear in the examined infection (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.109.6-110.8).

Apart from mental diseases, the writer tried also to give directions in order to distinguish this infection from other corporal diseases by the other physicians. He advised that this infection is different from cases of ileus because in the second disease there is suppression of the function of the bowels. The presence of intestinal cramps in worms' infection was used by Caelius Aurelianus as diagnostic criterion in order to separate this disease from a wasting disease or a disease of esophagus because, according to the physician, in these latter diseases this symptom was missing. Finally, the writer pointed out that the withhold of food could deteriorate the condition of the patient in worms' infection, fact which was used in order to distinguish the symptoms of the contraction of the lips or the sucking or also the jumping up without reason during sleep of patients suffering of this infection from persons expressing the same symptoms naturally or due to excessive consumption of food (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.886-889, 110.9-111.11).

#### *Treatment of worm's infection*

Caelius Aurelianus was also interested in the treatment of worms; therefore, he devoted a great part of his study on the drugs used to fight this condition. He mainly listed almost all the ancient drugs made by plants and also all the other therapeutic methods introduced in the antiquity in order to treat this pathological condition.

Before examining the ancient drugs, we should discuss the other therapeutic methods, which were not only applied against worms but they were used as a general treatment almost in all corporal or mental diseases. Venesection, fomentation, cupping with scarification, a relaxing poultice and plasters were these methods [11]. Now due to the fact that Soranus of Ephesus and Caelius Aurelianus were members of the methodic school of medical thought they advised that these measures should be introduced when a state of stricture was pres-

ent in patient's body, except of the plasters which were used in a state of looseness [12]. Plasters were made by ground lupines, vinegar and honey with an admixture of sprinkle of spoonful of the savings of stag's horn or ground lupines soaked in a decoction of wormwood proper or Santonian wormwood, when worms appear during the interval or remission of another disease (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.892-895, 119.2-120.10).

The main drugs used against worms were olive oil, sharp foods as onion, garlic, mustard juice, silphium juice, Pontic wormwood, wormwood of the sea, Santonian wormwood, while there were also used aloes, cardamom, mulberries, nettle and chamelaea. From all the above remedies, the main drug was olive oil. It was used as a clyster and as a vomitive. The main idea of the use of olive oil was to remove, either alive or dead, the worms of the human body. Olive oil was used alone as a clyster, in order for a faster removal of worms mainly from the intestines. Nevertheless, olive oil in a mixture with hot water was used as vomitive or laxative, in order the worms mainly from the stomach to be expelled (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.890-893, 117.3-14, pp.894-901, 122.7-130.10).

Regarding the sharp foods, which were described above, the purpose of their use was mainly to kill the worms and secondly to be driven away from the organism, because this could be achieved by olive oil. They could be consumed alone and uncooked or slightly cooked, in order to not lose their strength. They could also accompany the meal of the patient. These foods were characterized by more drastic and more powerful measures. The rest remedies were considered as milder drugs but also effective in milder conditions (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.894-895, 121.7-122.6).

## ■ DISCUSSION

This study on worms is very important for many different reasons. First of all, Caelius Aurelianus and furthermore Soranus of Ephesus, preserved the views of many other ancient Greek physicians regarding the prognosis of a worm's infection depending on how the worms were drawn out of the human body and if they were dead or alive, which now are lost in their original texts. The Ro-

man physician listed the views of Hippocrates (ca. 460-375/351 BC) as they were saved in *Corpus Hippocraticum* [13], Diocles of Karystos (375-295 BC) [14], Chrysippus (280-205 BC) [15], Herophilus (ca. 330-250 BC) [16], Apollonius of Glaucus (1<sup>st</sup> or 2<sup>nd</sup> c. AD) [14], Apollonius of Memphis (3<sup>rd</sup> c. BC) [2] and Antiphanes of Delos (2<sup>nd</sup> c. AD) [17] (Caelius Aurelianus *On Acute Diseases and on Chronic Diseases* pp.888-891, 112.1-115.7).

He wrote that, according to Hippocrates in his books *Prognostic*, the expulsion of dead worms was a sign for the oncoming death of the patient, while it was believed that the presence of dead worms in the human body indicated the aggravation of the conditions and that the body was in a state of decomposition.

Similar ideas were expressed by Diocles of Karystos who in his book *Prognosis* wrote that the vomiting or the anal expulsion of worms was not something unusual and without a great importance as a unique symptom. Nevertheless, this physician pointed that dead and empty worms were a sign of recovery or a deadly one if they were alive, full and bloody, while this second condition of worms was considered in his other work *On Evacuations* as a sign of fever.

Chrysippus commented on these views. His own idea was that the expulsion of dead worms was a sign of the oncoming death of the patient, only when it was present in acute or severe diseases, believing also that dead worms affirm the weakness of the patient, opinion which resembles the abovementioned of Hippocrates. In order to support his argument on dead worms, he used another view of Hippocrates on worms from the same Hippocratic work, that when a disease reached a crisis the expulsion of worms with feces was a good sign, therefore Chrysippus pointed that the discharge of worms covered with feces should not preoccupy the physician adding also that the same meaning had Diocles of Karystos' views on dead worms which were mentioned before.

Different opinion had Herophilus who, as an answer to Hippocratic view, believed that the expulsion of worms was not a sign which could provoke the unquiet of the physician.

This was also accepted by Apollonius of Glaucus who in his work *On Internal Diseases* stated that the expulsion of round worms could be a sign of chronic indigestion on the beginning but finally a sign of deterioration and that a terminal condi-

tion is coming. He also considered the expulsion of alive, fully and bloody worms as a bad sign. Apollonius of Memphis' belief was that in general the presence in the intestines of worms in any disease was a sign of deterioration and of a severe disease which could become even more dangerous if the worms were expelled dead than alive. Finally, Antiphanes in his work *Panoptes* (seeing everything), considered better the discharge of worms from the anus than from the mouth during a vomit and he preferred for the good of the patient that the worms were not covered with feces. None of the above ideas has been preserved in its original text. Even the Hippocratic view used by Caelius Aurelianus can not be traced in Corpus Hippocraticum as it is saved today, although in Corpus Hippocraticum are found many others on the theme of worms [2]. In the original work of Soranus of Ephesus, *Gynaecology*, written in Greek we can find the same views on worms' infection as they are found in this Latin translation, regarding the differential diagnosis of the loss of logic and the characteristics of the pulse (Soranus Med. *Gynaeciorum libri iv* 3.27.1.1-5, 3.27.1.2-1-5, 3.27.4.4-5), fact which allows us to believe that Caelius Aurelianus Latin translation followed the original work of Soranus of Ephesus [18]. Many ancient Greek physicians dealt with the theme of worm's infection. Apart from the rest references in many works of Corpus Hippocraticum (Hippocrates Med. et Corp. *De morbis popularibus*, *Prognosticon* 11.13-14, *De morbis popularibus* 4.1.55.2-3, *Aphorismi* 3.26.2-3, *Coa praesagia* 589.4-5, *De semine, de natura pueri, de morbis iv* 54.1-3) [19], wrote on the theme Galen (ca. 129-210 AD) (Galenus Med. *De methodo medendi libri xiv* 10.1004.17-10.1020.17) [20], Pseudo-Galen (1<sup>st</sup>-2<sup>nd</sup> cen. AD) (Pseudo-Galenus Med. *Introductio seu medicus* 14.755.5-7) [20], Archigenes of Apamea (1<sup>st</sup>-2<sup>nd</sup> cen. AD) (Archigenes Med. *Fragmenta* 14.30-15.23) [21], Pedanius Dioscorides (1<sup>st</sup> cen. AD) (Dioscorides Pedanius Med. *De materia medica* 3.34-79) [22], while Byzantine physicians such as Oribasius of Pergamon (ca. 325 - 395/6 AD) (Oribasius Med. *Libri ad Eunapium* 4.89) [23], Aetius of Amida (5<sup>th</sup> - 6<sup>th</sup> cen. AD) (Aetius Med. *Iatricorum liber ix* 37.1-117) [24] and Paul of Aegina (7<sup>th</sup> cen. AD) (Paulus Med. *Epitomae medicae libri septem* 4.57) [25], who save the ideas of the physician Herodotus (2<sup>nd</sup> half of 1<sup>st</sup> cen. AD) [26], repeated the views on this disease of their ancient Greek predecessors.

Except of Pedanius Dioscorides who wrote with great detail but only on the plant which could be used as medicaments for the treatment of worm's infection, the rest physicians mainly followed the Hippocratic ideas as seen in Corpus Hippocraticum, that is to say the identification of the basic three types of worms: the small and round worms, the long and wide ones who could be developed in almost all the length of the bowel and the smallest ones having the name ascarides (Greek: 'Ασκαρίδες, maw-worms) which were found mainly in the rectum. In addition, they spoke about the emaciation of the body they provoked, their presence during fever or not, the ways they could be expelled from the human body, the prognosis of the patient according to their expulsion from the body and if they were alive or dead, the critical condition of the patient in cases of severe infections and finally the fact that this type of infection was mainly a children disease.

Nevertheless, no other physician presented a comprehensive and systematic study on this infection as Caelius Aurelianus did. This detailed analysis by the Roman physician was very helpful for each physician of that time in his daily clinical work, because Caelius Aurelianus presented in extenso, as no one before, all the types of the disease, its semiology, the differential diagnosis and the main therapeutic approaches. It should also be underlined that no other physician focused on the differential diagnosis of the loss of logic and the aphonia that could be presented by the patients in this condition as this physician did.

Comparing this study of Caelius Aurelianus with rest of the other physicians we could infer that worm's infection was a pathological condition which preoccupied a lot the ancient physicians. Although the majority of patients in ancient times were children, these physicians recognized worm's infection also in adults. In addition, worms' infection was considered not only as a special disease but also their presence was described in severe cases of sepsis when their appearance was a sign of the upcoming death.

The management of this infection was very difficult as we can infer from the many different plants which were used in order to make the various medicaments, apart from the standard methods of healing which were applied against all the diseases in antiquity such as venesection.

The intention of the physicians and also of Caelius

Aurelianus was to drive out of the human body the worms either dead or alive. The initial treatment was intended to treat the worms in the mildest way so that they could be killed and disposed of by normal pathways. That's why the treatment was initially mild and the patient was allowed to eat normally and patches were applied on the abdomen. Successively appropriate drugs were administered and enema was finally prescribed. In most cases where it was necessary to eliminate the worms as soon as possible, laxatives or emetics drugs and enema were applied immediately.

## ■ CONCLUSION

Caelius Aurelianus' study on worms was the most complete study on the theme in antiquity. All the aspects of the disease were covered and all the necessary treatments were also described with the advice when each of them should be applied. From the ancient text in general we could indentify as tapeworms belonging to the genus *Taenia* those worms which were described as developed in great length in the bowels, while the round ones probably belonged to various species of elminths such as *Ascaris*, *Onchocerca* and *Rhabditis*. There is a heated debate in literature whether in this Latin text are translated only the views of Soranus of Ephesus or Caelius Aurelianus inserted his own additions. Although it is believed now that the great part of this Latin translation follows Soranus of Ephesus ideas, no one should deny that Caelius Aurelianus made also his own observation on the diseases and above all he organized the text adding his own views in a way that resembles or at least forebodes the modern methodology of medical study [27].

## Conflicts of interest

None

## ■ REFERENCES

- [1] Pioreschi P. An History of Medicine, Roman Medicine, Vol. 3 Omaha: Horatius Press. 1998.
- [2] Drabkin I.E. (Ed. and Trans.). Caelius Aurelianus. On Acute Diseases and On Chronic Diseases. Chicago: University of Chicago Press. 1950.
- [3] Allbutt T.C. Greek Medicine in Rome. London: Macmillan. 1921.
- [4] Pigeaud J. Folie et cures de la folie chez les médecins de l'antiquité gréco-romaine. La manie. Paris: Les Belles Lettres. 2010.
- [5] McDonald G. Concepts and Treatments of Phrenitis in Ancient Medicine, Ph.D. Thesis. Newcastle University. 2009.
- [6] Laios K. Mental Diseases according to ancient Greek Physician. Post-Doc Study. Medical School. National and Kapodistrian University of Athens. 2013.
- [7] Temkin O. Soranus' Gynecology. Baltimore [u.a.]: Johns Hopkins Univ. Press 1991.
- [8] Laios K., Giatsiou S., Tsoucalas G., Makaritsis K., Daios G., Sgantzos M. Apoplexy inside Hippocratic Collection. *Iatriki* 104 (5-6), 288-292, 2015.
- [9] Temkin O. The Falling Sickness. History of Epilepsy from the Greeks to the Beginnings of Modern Neurology. Baltimore; London: The Johns Hopkins Univ. Press. 1994.
- [10] Simon B. Mind and Madness in Ancient Greece. The Classical Roots of Modern Psychiatry. Ithaca: Cornell university press. 1978.
- [11] Pioreschi P. An History of Medicine. Greek Medicine. II. Omaha: Horatius Press. 1994.
- [12] Tecusan M. The Fragments of the Methodists: Methodism Outside Soranus. Leiden; Boston: Brill. 2004.
- [13] Jouanna J. Hippocrate. Paris: Fayard. 1992.
- [14] Van der Eijk P.J. Diocles of Carystus. A Collection of the Fragments with translation and commentary. Leiden: Brill. 2000.
- [15] Arnim J von. Stoicorum veterum fragmenta. Leipzig: Teubner. 1903.
- [16] Von Staden H. Herophilus. The Art of Medicine in Early Alexandria. Cambridge: Cambridge University Press. 1989.
- [17] Smith W. Dictionary of Greek and Roman Biography and Mythology. Boston: Little, Brown and Co. 1867.
- [18] Ilberg J. Sorani Gynaeciorum libri iv, de signis fracturarum, de fasciis, vita Hippocratis secundum Soranum. Leipzig: Teubner. 1927.
- [19] Littré É. Oeuvres complètes d'Hippocrate. Paris: Baillière. 1840-1851.
- [20] Kühn C.G. Claudii Galeni opera omnia. Vol. 10. Leipzig: Knobloch. 1825.
- [21] Brescia C. Frammenti medicinali di Archigene. Naples: Libreria Scientifica Editrice. 1955.
- [22] Wellmann M. Pedanii Dioscuridis Anazarbei de materia medica libri quinque. 3 vols. Berlin: Weidmann. 1907-1914.
- [23] Raeder J. Oribasii synopsis ad Eustathium et libri ad Eunapium. Leipzig: Teubner.
- [24] Zervos S. Αετίου Αμιδηνού λόγος ένατος. *Athena* 23, 273-390. 1911.
- [25] Heiberg J.L. Paulus Aegineta. 2 vols. Leipzig: Teubner. 1921-1924.
- [26] Leven K.H. Antike Medizin: Ein Lexikon. München: C.H. Beck. 2005.
- [27] Van der Eijk P.J. Medicine and Philosophy in Classical Antiquity. Doctors and Philosophers on Nature, Soul, Health and Disease. Cambridge, UK; New York: Cambridge University Press. 2005.