

# ALLIANOI : THE ANTIQUE THERMAL SETTLEMENT OF ANATOLIA AND ITS IMPORTANCE FOR MEDICINE AND ARCHITECTURE

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## Abstract

The aim of this study is to make evaluations about thermal in terms of medicine and architecture by using historical point of view and analysing Allianoi example. Allianoi, which is the most improved antique thermal settlement of Anatolia, was used from 2<sup>nd</sup> century B.C. to 1998 A.D. The thermo-mineral waters of Allianoi (an alkaline bicarbonate waters containing a small amount of natural carbondioxide gas) were used for the cure of dermatological, rheumatological and orthopedical diseases (by bath techniques) and also for gastrointestinal, urologic and metabolic treatements (by drinking cures). Allianoi Thermal Settlement contains the main elements of Roman Cities (for example : Decumanus-Cardo, Nymphaeum, Propylon, Peristylled Court, Stoa, Insula, Cryptoporticus) and it is planned according to the grid planning type. Allianoi's thermal buildings consists of Roman Thermal Baths. These spaces containing main elements of Ancient Age Bath Architecture (for example : Apodyterium, Frigidarium, Tepidarium, Caldarium, Laconicum) also had thermal cure baths and various application spaces. At Allianoi, beside the thermal treatment spaces, surgical application areas were also placed. An analyse of Allianoi Thermal Settlement Area in terms of planning and architecture shows similarities with the planning and architectural design criteria of todays settlements. In conclusion, Allianoi, by giving us important lessons about "Thermal Medicine" and "Thermal Architecture", helps us to build a bridge from the past to the future. We can see the proof of famous saying "Our past is the key to our future" in Allianoi example.

*Keywords : Asclepius, Asclepieion, Allianoi, spa therapy, thermal settlement, Roman Thermal Bath*

## Résumé

**Allianoi : la station thermale antique d'Anatolia et son importance pour la médecine et l'architecture.**

L'objectif de cette étude est de faire une évaluation du point de vue médical et architectural des thermes dans une perspective historique en utilisant comme exemple les thermes antiques d'Allianoi, la station thermale la plus développée de l'Anatolie. Allianoi a été utilisé depuis 2 siècles avant Jésus-Christ jusqu'en 1998. Les eaux thermo-minérales d'Allianoi (eaux alcalines

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bicarbonatées sodiques qui contiennent une faible quantité de gaz CO<sub>2</sub>) étaient utilisées pour le traitement des maladies dermatologiques, rhumatologiques et orthopédiques (par la méthode de bains thermaux) et aussi pour des pathologies gastro-intestinales, urologiques et métaboliques (par la cure de boisson).

La station thermale Allianoi possède les principales caractéristiques des villes romaines (ie Decumanus-Cardo, Nymphaeum, Propylon, Cour Péristyle, Stoa, Insula, Cryptoporticus) et est planifiée selon le plan de ville du type grille. Les structures thermales d'Allianoi sont les bains romains qui représentent les éléments principaux de l'architecture de bains de l'époque antique (Apodyterium, Frigidarium, Tepidarium, Caldarium, Laconicum, etc) et qui contiennent des piscines et des endroits divers pour le traitement thermal. Il existait aussi des endroits pour des interventions chirurgicales. Du point de vue de la planification et du point de vue architectural, Allianoi représente des similitudes avec les critères de planification des stations thermales d'aujourd'hui et de l'organisation architecturale contemporaine. En conclusion, Allianoi nous fournit des informations importantes sur la "médecine thermale" et "l'architecture thermale", et ainsi, fait le pont entre le passé et le présent. On peut en voir la preuve dans la fameuse maxime : "Notre passé est la clé de notre avenir" avec l'exemple d'Allianoi.

*Mots clés : Asclepius, Asclepieion, Allianoi, traitement thermal, la station thermale, bains thermaux romains*

## Introduction

In antique mythology, Asclepius who was curing diseases of people, was the god of the medicine and medical science (Figure 1).

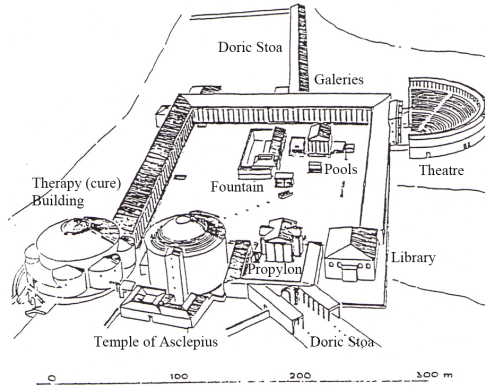


**Figure 1. Asclepius**

Source: Yaraş A, 2001, p.12.

Health centers which were built in the name of the son of God Apollon are called "Asclepieion (Asclepius' place)" [1] and this place is also described as "Holy Area". Asklepieion of Anatolia is located in Pergamum Antique City. The building of the Pergamum Asklepieion Health Center began in the Hellenistic Age (2<sup>nd</sup> B.C.) and at its

door it was written “It’s forbidden for death to come in” [2]. In Pergamum’s Asclepieion, there was Asklepios temple, library, meeting rooms, theater, a cure building and a square that contained open pools and fountains which was surrounded by riwaqs (Figure 2) [3].



**Figure 2. Site Plan of Bergama - Asclepieion Health Centre**

Source: Radt W, 1984, p.71.

In that place, besides mud and herbal therapies, heliotherapy, psychotherapy and musical therapies were also applied [2,3].

In Anatolia, Allianoı was the most splendid thermal settlement which was implemented by using thermo-mineral waters (Figures 3 and 4).

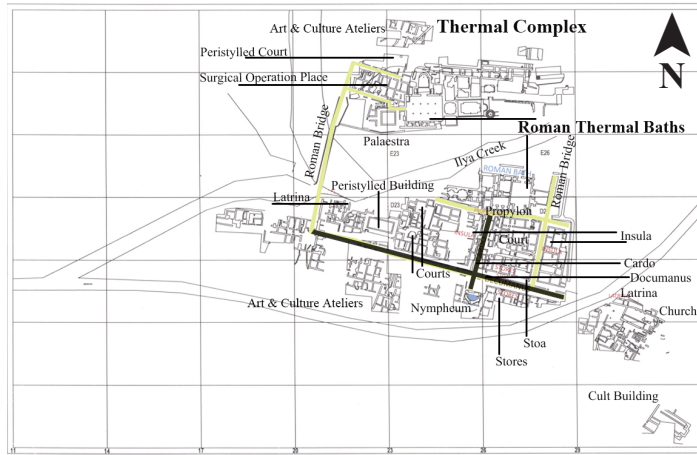


**Figure 3. General View of Allianoı**

Photo: Nevin Çekirge Archive, 2008.

This thermal cure center that was under protection of God Asclepius and which brought honor to his existence, was described at the same time as a summer resort. The discussions about Allianoı whether being 2th. Asclepieion of Anatolia are still continuing [4]. However, Allianoı being constructed at the same time as Pergamum Asclepieion Holy Area

**Figure IV - Plan of Allianoi Thermal Settlement**



Source : Sahin B. et al. 2008.

and being located close to this area (18 km), points out that between the two health centers there was a connection in terms of medical applications, intellectuality and religion [5]. In this study, Allianoi's history, the characteristic of its thermo-mineral waters and their medical indications and medical use will be explained. Besides, Allianoi's analyse in terms of urban planning and architecture will be presented in this paper, and its messages about planning, architecture and medicine will be discussed by comparing all it's features with the thermal settlements of today.

## History

The valley where Allianoi is situated on, has been used since 3000 B.C. Allianoi Thermal Settlement was constructed at the Late Hellenistic Age (2<sup>nd</sup> B.C.) when Pergamum Kingdom was reigning and by improving during the Rome Emperor Hadrianus (2<sup>nd</sup> A.D.) it became a famous and magnificent Health Center [6]. However, after the earthquake that occurred in 262 A.D. some of the thermal buildings lost their original function and thereafter they were used for other purposes [7].

Allianoi which was used continuously during the Byzantian Period (between 6.-11. A.D.), was also used during the Ottoman and Republican periods of Turkish Anatolia. It was called "Pacha Spa" until 1998 when the archeological excavations began. We are sad to inform that, this region is submerged because of the construction of Yortanlı Dam in 2011.

## Physico-chemical characteristics of thermo-mineral waters

Today, the region where the thermo-mineral waters exist, is known as "Pasha Spa". The thermo-mineral waters of Pergamum Pasha Spa outcrops naturally from 4 sources of

temperatures varying between 41-45°C. The main characteristics of waters are similar to each other and also this study showed us that their features remain same for many years. Different samples taken from Izmir-Pergamun Pasha Spa thermo-mineral water sources at different times were analysed in different laboratories ; in this paper we analysed reports from different times that were published in Turkey Mineral Waters and Healing Water Books [8-11].

Thermo-mineral water sample taken from the bottom of antique pool was analysed in the Medical Ecology and Hydroclimatology Department's Balneology Laboratories of Istanbul Faculty of Medicine. The physico-chemical results of the analysis are shown in the Table 1.

**Table I - Physico-chemical analyse of Bergama Pasa Ilca thermo-mineral water analysed**

Kation	mg/l	milival/l	% milival	Anion	mg/l	mval/l	% mval
Na <sup>+</sup>	547.622	23.8200	80.4170	HCO <sub>3</sub> <sup>-</sup>	1634.8000	26.8000	89.9441
K <sup>+</sup>	100.878	2.5800	8.7102	SO <sub>4</sub> <sup>-2</sup>	73.3000	1.5270	5.1248
Ca <sup>+2</sup>	46.600	2.3300	7.8661	Cl <sup>-</sup>	45.0000	1.2693	4.2600
Mg <sup>+2</sup>	10.332	0.8513	2.8706	F <sup>-</sup>	3.1100	0.1638	0.5497
Zn <sup>+2</sup>	0.500	0.0159	0.0537	HAsO <sub>4</sub> <sup>-2</sup>	0.6512	0.0093	0.0312
Total Kations	706.297	29.6206	100.0000	Total Anions	2464.5482	29.7963	100.0000
H <sub>2</sub> SiO <sub>3</sub> : 23,660 mg/Lt ; HBO <sub>2</sub> :13,284 mg/Lt							
EC: 2.3x10-3 mho ; Temperature : 43.3°C ; pH : 6.64							
Free CO <sub>2</sub> : 410,08 mg/l ; Radon Rn <sup>222</sup> : 300 Pci/l ; Total mineralisation : 2501,4956							

Source: Yenil et. al, 1975, p.108.

According to this table, the features of water that are effective in cure are as follows : the temperature of 43.3°C, total mineral content of 2501,45 mg/l, carbon dioxide, fluoride, zinc, arsenate, meta-boric, meta-silikat acid and radon gas of very low amount (Rn222:300 Pci/l).

If we compare the analysis results from different times, we see that the main characteristics are preserved (Tables 1, 2 and 3). However, it was seen that the carbon dioxide and meta-silikat acid concentration of the water which has a very few amount of natural carbon dioxide that is qualified as alcalin water, has decreased over time (Carbon dioxide decreased from 843 mg/l to 410,08 mg/l and meta-silikat acid decreased from 55,6 mg/l to 13,284 mg/l).

**Table II - Physico-chemical analyses of three sources of Bergama Pasa Ilıca**

	1. Source	2. Source	3. Source
Temperature	39°C	43,5°C	43,5°C
pH	6.2	6.2	6.2
Total mineral	2756,234 mg/l	2774,67 mg/l	2922,68 mg/l
H <sub>2</sub> SiO <sub>3</sub>	55,6 mg/l		

Source: Çağlar K Ö, 1970, 1947, p.111-114.

**Table III - Balneotherapy report of Bergama Pasa Ilıca**

Temperature	49°C	
pH	8	Banyo yöntemiyle romatizma ve cilt
CO <sub>2</sub>	843 mg/l	hastalıklarında kullanılır
Total mineral	22912 mg/l	

Source: Reman R, 1942, p.405.

## The medical indications of thermo-mineral waters and their usage

People took advantages of the curing waters [12] that were used at the antique period, until 1998. In the first quarter of 20<sup>th</sup> century, although there were no place to accommodate in that area, many guests were coming and staying at barracks. It is also known that thermo-mineral waters that were preferred specially by people having rheumatism and dermatological problems, were accelerating wound healing [13].

People took advantage of Pergamum Pasha Spa for the following purposes : as spa applications for rheumatism, dermatological and gynecological problems, as drinking cures for liver, stomach intestine and gall-bladder problems, as a supportive treatment and rehabilitation, as a protection for oral and dental health because of its fluoride content. It is informed at the website of Izmir Municipality that [14] “The intended uses of Pergamun Pasha Spa are as a spa water and as a cure of chronic rheumatismal, metabolic, senility, weakness, kidney and gynecological problems”.

Cure spaces and different pools, resting areas, fountains and drinking cure areas found at the archaeological remains of Thermal Center that was built in the 2<sup>nd</sup> B.C show that, Allianoi served as mineral water drinking center beside its spa function.

## The planning of Allianoi thermal settlement

Alliaoni Thermal Settlement is founded in a total area of approximately 30.000 m<sup>2</sup> (Figure 4 above) [15]. The northern and southern area settlements which are divided into 2 parts by Ilya (Yortanlı) Creek, are connected to each other by 2 Roman Bridges.

During the antique age, Ilya Creek was taken into a vaulty drainage channel but after the demolition of the vault because of the earthquake in 262 A.D., Ilya Creek came off [16]. The settlement in the south of Ilya Creek was constructed conveniently to the grill which is the the characteristics of the Roman Urban Planning. For instance, there were main collonnade roads which are perpendicular to each other ; in eastern-western (Decumanus), and northern-southern directions (Cardo). There were also streets connecting to these avenues.

At the intersection of Decumanus and Cardo, there was a square and at the south area there was a semi-circular, exedra typed, monumental drinking fountain (Nympheum). Besides, at the north of Cardo, the monumental building (Propylon) that was connected to thermal area was placed.

At both sides of the Collonnade Road, there were Stoas and behind them shops and storages were located. Behind the shops, regions which are columned and that have courts with private fountains (Atrium or peristylled court) were existing and around them 4 Insulas (residential area) were placed [17]. Probably, this area was used as accommodation by the guests of Allianoi.

Furthermore, at the south of Ilya Creek there were thermal Roman bath and latrinas (public toilets), art (ceramics) workshops and kilns, a basilical planned church, 2 cemetery chapels (small churches), necropolis (cemetery) and a cult building [17].

At the north of Ilya Creek, a thermal building complex was located. It is believed that the rooms at the downstairs of this building were used as accommodation. The vaulty undergrounded corrido (Cryptoporticus) that is located at the north of thermal building, connects the 2 Roman Bridges to each other. The entrance of the thermal building is through the Palaestra that is at the western side. In the middle of this court there is Nympheum (Monumental Fountain) and at the northern side, ceramic workshops and kilns are placed. Also, this area has surgical operation places which contains medical tools.

Beside its thermal buildings, Allianoi was also very important in terms of being an art center. There were 15 kilns, two glass ovens and an iron atelier. Art works (ceramics, glass, iron) that were made in Allianoi were sold in Bergama and in other neighbouring cities (Figure 5) [18].



Metal Household Items



Glass Ware



Ceramics

### **Figure 5. Artworks of Allianoi**

*Source:* Yaraş A, et al. 2001. p. 10,13.

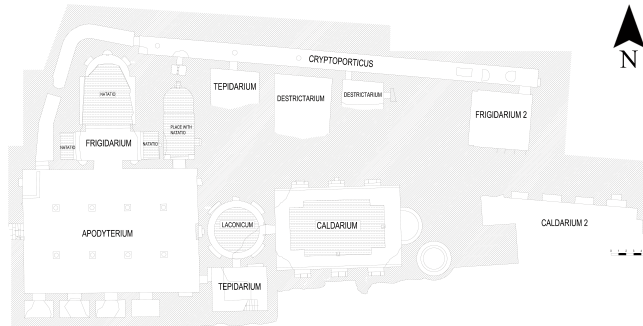


## Architectural design of Allianoi thermal buildings

In Allianoi there are northern and southern thermal buildings and a surgical operation area. One third of the Allianoi Settlement Area (11.000 m<sup>2</sup>) consists of thermal buildings.

### Northern thermal complex

In the thermal complex, there are Roman Thermal Baths (Figure 6).



**Figure 6. Plan of Roman Thermal Bath(s)**

*Source: Sahin B. et al. 2008.*

The vaulty undergrounded corridor (Cryptoporticus) connects all the places to each other. There are 8 places of similar sizes which are located on top of this tunnel. Probably, these places were primarily used as accommodation but after the catastrophic events such as flood and fire that occurred after the earthquake of 262 A.D., they could be used for other purposes (animal shelter, etc.,).

### Roman Thermal Bath

In The Roman Thermal Bath, there are Apodyterium (undressing), Frigidarium (frigidity), Tepidarium (dry temperate), Caldarium (humid warm place) that are vaulty and domed main places of Roman Bath Architecture. Furthermore, there are Laconicum (warm and steamy perspiration room), places with Natatio (unwarm pool) and Destrictarium (places where oily massage was done) [19].

The entrance to the Apodyterium of Thermal Bath is done through Palaestra and Cryptoporticus. In the Apodyterium there are 4 undressing niches and both sides of niches a platform (dressing-undressing place) is located [20]. In the middle of the Frigidarium, a big Natatio and at the entrance 2 small Natatios are still exist. On the nich which is at the middle, a fountained Nymph (water fairy) is found (Figure7).

There were transitions from Apodyterium to Tepidarium and from Tepidarium to Laconicum. In the magnificent space Caldarium, a perpendicular thermal treatment pool that is encircled by sitting niches was placed and the thermo-mineral water applications were carried out in that place. The other places of the Thermal Bath are Natatio and Destrictarium.





**Figure 7. Nymphaeum**

*Source: Yaraş A, et al. 2005, p.12.*

Beside all these, some places that are believed to be Tepidarium, Frigidarium and Destrictarium were also discovered [19]. All those findings give the impression that there were 2 separate Roman baths (for men and women).

### Surgical Operation Places

In the Antique Age, thermo-mineral baths were also ideal for medical doctors. In these places, beside thermal applications, medical applications such as surgical operations were common as well [21].

The bronzed medical tools (surgical operation) found during excavation in Allianoi show that there is a probability of surgical operations beside the thermo-mineral therapies in that place (Figure 8) [22].



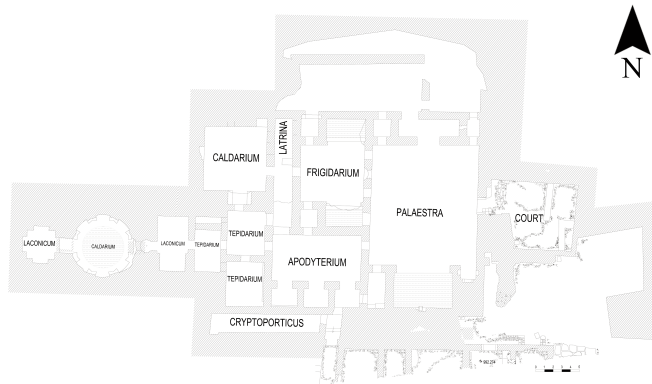
**Figure 8. Context Bronze Medical Tools**

*Source: Yaraş A, et al. 2003.*

Two crushing stones that were placed in marble mortal found beside the medical tools, were most probably used for drug production.

### **Southern Roman thermal bath**

The entrance to the Southern Roman Thermal Bath is through the wide square next to Palaestra (Figure 9) [19].



**Figure 9. Plan of Southern Roman Thermal Bath**

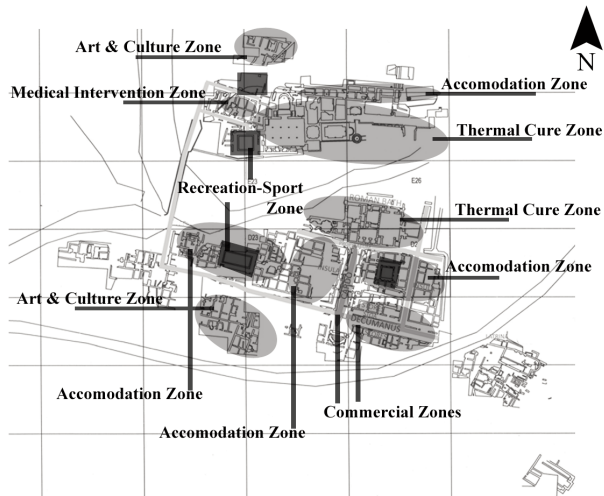
*Source:* Sahin B. et al. 2008.

In the middle of the Palaestra there was a court in the form of square that is surrounded by 4x4 columns. Also, on one side of that court a guttered pool was located [23]. On the Frigidarium “another magnificent place of Bath”, there were 2 pools facing one another. On the one side of Apodyterium that is connected to Palaestra and Frigidarium, there were 3 resting areas and in each of them, 2 platforms used for dressing and undressing were placed [23]. Furthermore, there were Caldarium, Tepidarium [19], latrine (toilet) [24] which was connected to Apodyterium and Frigidarium and also some places containing Hypocaust. Hypocaust, which is covered with thick bricks, is composed of clay water pipes that stand perpendicular under floor [23]. Upper the Hypocaust, there was Laconicum.

Another important area of the bath is “octagonal Caldarium” which has rounded thermal pool in its middle. The arched niches that are around the thermal pool have sitting platforms. During the early Byzantine Period, Caldarium was frequently used as a spa. However, in later years that place was used as Nekropol (Cemetery) [25]. Beside Caldarium there was Chapel [25] (According to some sources it is called Laconicum) [19].

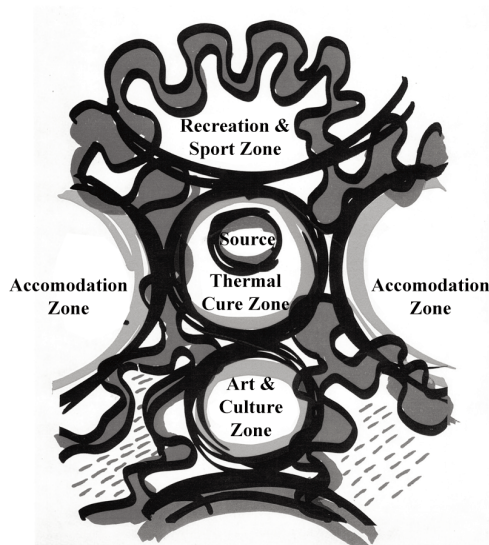
### **Evaluation of Alliano in terms of planning and architecture**

The characteristic settlement zones in Alliano are the thermal cure zones, the medical intervention zone, accommodation zones, commercial zones, art and culture zones and recreation-sport zones (Figure 10) [26].



**Figure 10. The Zones of Alliano Thermal Settlement**  
 Source: Çekirge N, Gürdal H, 2010, p.13

These zones are similar to the ones that exist in the thermal settlements of present day (Figure 11) [27].



**Figure 11. The Zones of Modern Thermal Settlement**  
 Source: Glaus O, 1975, p.40.

According to this evaluation, 2000 years ago Allianoi had the zones and functions of today's contemporary thermal settlements.

An analysis of Allianoi's Thermal Roman Baths in terms of architecture indicates that, Allianoi had open-air exercise areas (Palaestra and different courts), fountains, dressing and resting areas (Apodyterium), circular or rectangular formed thermal cure pools (Caldarium), cold water pools (Frigidarium, Natatio), cure areas of various temperatures (Tepidarium), perspiration (vapor) rooms (Locanicum), oily massage areas (Destrictarium) and medical (surgery) intervention areas. All these areas / functional spaces which are also the main places of today's thermal buildings, were parts of Allianoi. Besides, medical intervention area together with thermal cure places, reminds of the today's cure hospital and clinics.

## Conclusion

At the Antique Age, people were believing that the healing characteristic of thermo-mineral waters results from the magic of religious or supernatural forces. Thermal Baths were considered as under the protection of Nymphes and gods of nature (Asclepius, Hygeia, Aphrodite, etc.). These buildings are also determined the sacred place of Nymphes. The patients cured in here gave presents and took vows in order to thank [28].

Allianoi opened its doors to the people from all around the world and became the most famous Thermal Cure Center of its period. From various publications and archaeological finds, it's understood that Allianoi with its different cure spaces and pools, fountains, exercise and resting areas was a very successful thermal cure and rehabilitation complex. From the publications of today and 70 years ago, it's understood that the main characteristic of thermo-mineral water which is the main component used in spa therapies applied in thermal center hasn't changed. Thus, it was used during bath applications for curing dermatological, rheumatological and orthopaedical diseases and during drinking cure for the treatment of gastrointestinal, urological and metabolic diseases. Therefore, it should be considered that thermal buildings in Allianoi were used for the cure of similar diseases.

As seen in the case of Allianoi, the settlements where Roman thermal baths are located, along being thermal therapy centers were also important health (treatment) centers where physicians were doing medical interventions.

It should be considered that, Pergamum Asclepion and Allianoi being two health centers built in the same period of time and located close to each other, were supporting each other in terms of medical applications. Therefore, in the Roman period, this region having two cure settlements side by side was also important in terms of human health.

Allianoi is the biggest and the most spectacular Antique Thermal Settlement found so far. Approximately 11.000 m<sup>2</sup> of the total area of Allianoi settlement (30.000 m<sup>2</sup>), consists of thermal cure and medical intervention places. Allianoi thermal settlement area examined in terms of architecture and planning, shows similarities with the planning and architectural design criteria of today's settlements. For these reasons, Allianoi being one of the first thermal settlement of thermal history, gives important messages in terms of planning, architecture and civil engineering.

Allianoi, by giving us important lessons about “Thermal Medicine” and “Thermal Architecture”, as well as “Thermal Science/Technology” helps us to build a bridge from past to future. We can see the proof of famous saying “Our past is the key to our future” in Allianoi example. This settlement is now waiting for being waking up from its sleep under water...

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