

# Measures of health care against yellow fever in the south-west of Extremadura (Spain) in the XIX Century

*Cuidados de saúde contra a febre-amarela no sudoeste da Extremadura (Espanha) no século XIX*

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## Abstract

Yellow fever, which made its way to Europe through commercial trade with America, was a terrible disease which provoked different epidemics throughout the XIX century.

In the present paper, we discuss the sanitary measures taken during the XIX century in order to avoid the spread of the disease in the south-west of Extremadura, in Spain. To do so, we have used historic and municipal archives as well as church archives from a number of different localities.

### Key Words:

Yellow fever, XIX century, South-west of Extremadura, Spain, public health.

## Resumo

A febre amarela, que entrou na Europa através das rotas de comércio com a América, foi uma doença terrível, responsável por diferentes epidemias ao longo de todo o século XIX.

Neste artigo, discutiremos as medidas sanitárias adotadas durante o século XIX com o objetivo de perceber a proliferação da doença no sudoeste da Extremadura, em Espanha. Utilizaremos como metodologia os dados históricos dos arquivos municipais e das paróquias de diversas localidades.

### Palavras Chave:

Febre-amarela, século XIX, sudoeste da Extremadura, Espanha, saúde pública.

## Introduction

Epidemics have produced a range of mixed feelings among people as well as among social groups as a whole [1]. Such feelings include fear, hate and over-exaggerated spirituality to name but a few.

Humans also have a part to play in the development and propagation of an epidemic. Social, as well as economic factors (including commercial, political and military), related to our lives, bring about the appearance, modification and disappearance of diseases [2].

Some people think that history is static; a grave error which leads them to the point of not understanding the present and understanding the past as a static or fixed image, removing themselves from the current paradigm: things move but at the same time they experience change.

The hygienic and health conditions in the region of Extremadura throughout the XIX Century were by character highly deficient; the streets were a sorry sight, the sewage systems were non-existent which meant that dirty water flowed directly onto the streets. Neither was there a system of rubbish collection which led people to dump their waste wherever they chose to do so within the boundaries of the municipal area [3]. The atmosphere in the main cities at the time was a focal point of bad health and infection. Sewage systems, in places where they did exist, were inadequate, inefficient or inoperative. Furthermore, there was little or no health control or cleaning of septic tanks which contaminated the under soil and often overflowed, allowing the stagnant water to cause bad health. Unsightly piled up animal manure was to be found everywhere. Waste material, rubbish, dirty water and other residual products thrown onto the streets on a daily basis turned the public areas of the towns into dunghills and rubbish dumps [4]. All these factors combined together caused vile smells, unhealthy fumes and vapours and emissions of dangerous gases which put Public Health in grave and permanent danger [5].

Yellow fever, also known as Siam sick, Barbados fever [6] or black vomit [7], was a disease which was believed to have spread from Africa to equatorial and tropical America during the time of the slave trade [8]. These claims were proven true by the use of molecular techniques through which it was seen that the strains of yellow fever found in America had lost part of a repetitive sequence of the genus in coded region 3', a phenomenon which does not occur in the African strains thereby clearly showing its African origin [9].

It was one of the most feared contagious diseases which caused major epidemics in Africa and America from the XVIII to the XX centuries [10]. Today the number of deaths due to yellow fever in people who haven't received the vaccination may reach the 50% mark. It is estimated that in the world there are 200,000 new cases of yellow fever each year which lead to 30,000 deaths, 90% of these being recorded in Africa alone [11].

Carlos Finlay, in his speech made for the Royal Academy of the Sciences and published in Habana in 1881, stated that, with respect to yellow fever, that are false the theories which claim: "...that the origin or propagation of the disease is due to atmospheric influences, miasmatic or meteorological influences lack of personal hygiene or the absence of general hygienic measures..." [12:395]. He attributed to the mosquito the spread of the disease, by biting a healthy person after doing it a sick. This is a huge advance in knowledge of the disease [13].

## Objectives

The objective here is to carry out a study of the epidemics of yellow fever in the south-west of Extremadura and to analyze the measures adopted by the different towns in the struggle to combat the illness.

## Material and method

A study has been done of the minutes books of the plenary sessions of the different town halls as well as their respective death registers of the corresponding local parishes.

## Pathogenesis of the disease

Yellow fever is an acute viral hemorrhagic disease which is transmitted by infected female mosquitoes, of the *Aedes* genus [14]. The term yellow alludes to ictericia or jaundice which some patients experience [15]. Its symptoms include high temperature, albuminuria, hemorrhage, blood vomit or vómito negro as well as ictericia [16].

The virus is endemic in the tropical areas of Africa and Latin America with a population of 900 million inhabitants. The number of cases of yellow fever has risen in the last two decades due to the decrease in immunity of the population, deforestation, urbanization of rural areas, population migration and climate change [11].

The virus responsible for yellow fever belongs to the genus known as *Flavivirus*, belonging to the family of the *Flaviviridae* [17]. It constitutes the prototype of the genre, with the whole family containing more than 70 different, yet related viruses, most of which are passed on by arthropods [18].

The means of transmission of the yellow fever virus is through an arbovirus of the *Flavivirus* type and its main vector is the mosquito which passes the virus on from one host to another, mainly between monkeys or between monkeys and humans as well as from one human to another [19].

There are several different species of the *Aedes* and *Haemagogus* mosquito that transmit the virus. Mosquitoes breed near homes (domesticated), wooded areas (wild) or in both

habitats (semi-domesticated) [20]. The larva can grow in a wide number of places, for example plant pots, used tyres, water jugs, cans and many other everyday objects which may contain even a tiny amount of water. The adult mosquito shows a great preference towards humans as a source of blood.

In America, two cycles of transmission occur: the jungle cycle, also known as the sylvatic cycle and the urban cycle, while in Africa we can find three:

1. The Jungle / sylvatic cycle is found in wet tropical forests where the infected mosquitoes bite the monkeys who in turn transmit the virus to other mosquitoes who then pass it on to humans who are normally young woodcutters who work in the forest.
2. The Intermediate cycle or savannah cycle: the semi-domesticated mosquitoes which inhabit the forests near houses bite humans and monkeys alike. This is the most common form of transmission and can cause short epidemics which can become more serious if they reach densely populated areas.
3. The Urban cycle: the infected people spread the virus in highly populated areas where there are a large number of *Aedes* mosquitoes as well as non-immune people, which results in serious epidemics. The infected mosquitoes pass the virus on from one person to another [21].

## Clinical diagnosis

The incubation period lasts between three and seven days and the illness itself lasts, where a cure is found, just one week. After incubation, the illness may take two different courses:

- A. Light: sufferers feel arthralgia, myalgia, headache, vomiting, etc., which lasts about one or three days, and clears up without any complications.
- B. Severe or classical: which includes epistaxis, bleeding of the gums, kidney and liver failure, haematemesis with blood vomit and ictericia, all of which lead to death in about ten to fourteen days [22].

The diagnosis is clinical and by using very specific laboratory tests, other diseases can be ruled out, such as the Zika, the Bolivian fever, the Argentinean fever, Chikunguaya, Ebola as well as malaria, dengue fever and hepatitis [11].

## Treatment

There is no treatment to cure yellow fever. It is symptomatic and treatment aims to alleviate the symptoms and to maintain the well-being of the patient and of course, to combat the mosquito. Vaccination is the most important method of prevention against yellow fever. The vaccine is safe, affordable, very efficient, and one single dose is sufficient to give

immunity and life-long protection without the need of a booster dose. The vaccine offers an effective immunity in 99% of vaccinated people in the space of 30 days [14].

## Yellow fever in the south-west of Extremadura in the XIX century

The very first European epidemic of yellow fever occurred in Lisbon in 1728 [23: 280]. Later other epidemics broke out in meridional areas [24: 91]: Cadiz (1730, 1800, 1804, 1810, 1819), Málaga (1741, 1803, 1804, 1810-1812, 1821), Barcelona (1821) and Pasajes (1823) [25: 65].

When the breakout of the yellow fever epidemic occurred in Cadiz in 1800, a great fear of infection spread among the population as the Peset brothers pointed out “Panic spread all over Spain” [26: 107].

The measures adopted against yellow fever are similar to those used against the great plague which devastated Europe up to 1720 in Marseilles: material measures of protection were reinforced and trading links were broken, vigilance and closure of the city grounds took place as well as isolation of the infected people, ports also had to be controlled, burning of the infected peoples belongings, even prayers were said and processions took place as well as invocations to certain saints as the plague was considered by many to be a divine punishment [27]. The same measures were taken when the cholera epidemic broke out in Spain in 1833 [28].

Certain printed documents state that in 1819, the Board of Health ordered the mayors of the towns along with the local health authorities of each town such as that of Zafra, not to allow people or goods coming from Seville or its surrounding areas to enter the town, as yellow fever had hit those areas and some of the streets there had been cut off. Isolation or incommunication is one of the main measures used to deal with the disease [29]. From the beginning of the century, epidemics were constantly arriving from America due to commercial trade and bad health organization, as well as the lack of control over the smuggling of goods [30]. Warnings were sent from Mérida to all the towns involved to adopt the necessary defence measures in order to avoid infection in Extremadura [31, 32]. These measures included the following:

1. Fumigation of all correspondence and mail.
2. Meticulous and continuous cleaning of the streets.
3. Setting up of a barracks in a suitable location whose purpose was to fumigate the general public passing through as well as any goods and merchandise coming from outside.
4. The establishment of a warehouse to gather merchandise coming from infected places.
5. The establishment of another warehouse to serve as a hospital for suspected diseases.
6. Banning of airing leather, skins or fur within the radius of the town.

7. Completely banning pigs from wandering the streets.
8. Carrying out cleaning and sanitation of drainage pipes and sewers or any other places which could be a source of infection within the town limits.
9. Carrying out a thorough inspection of all meat and fish destined for human consumption as well as vegetables, legumes, fruits or any other food substances and their respective selling posts or collection points.
10. Banning of clothes washing in streams passing through the towns or within the town limits.
11. Finally, by setting up a surveillance service at the entrance to the town in order to carry out any necessary measures demanded by the competent authority [33].

Therefore, as a result, the epidemic of yellow fever almost exclusively affected coastal areas and areas close to navigable rivers [34], as these were the natural entry points of a disease which was brought from Africa and America.

The problem of the mixing of drinkable and contaminated water was a serious cause for concern especially in big urban areas. Therefore every possible effort was made to improve water distribution services as well as to deal with residual or dirty water, thereby contributing to the struggle against transmittable diseases throughout the XIX century [35]. In 1804, it became mandatory to separate rain water and water coming from fountains, springs or wells from residual water coming from drain pipes [36]. This law forced governments in power during the second half of the century to make a big effort to sanitize and supply clean water to the cities and towns, as well as to set up an incipient International Health Service whose aim was to control transmittable diseases by organising International Health Conferences [37].

The measures taken to avoid infection were a combination of both medical and military, thereby proceeding to isolate members of the population who were affected by the disease. This form of isolation and incommunication were the most effective measures to deal with infection among people. However, protests were held as people demanded help and assistance. Poverty increased sharply in large cities where the needy gathered to seek help from charity organisations which were set up to deal with the problems. The Supreme Board of Health announced on the 21 February, 1833 to the Provincial Health Authorities, the need to establish quarantines in Galicia, Castilla la Vieja, Extremadura and Andalucía thereby preventing entry to individuals coming from Portugal, this was done with help from the Armed Forces [38].

Carlos Cipolla, referring to health measures taken during the first epidemic of cholera, states that they were "...an almost identical replica of what was done previously in the north of Italy during the XVI, XVII and XVIII centuries" [39: 21], based on the miasmatic theory [40] which claimed that "the diseases were related to the quality of the air depending on whether its saturation of Pestilence was higher or lower" [41:203], and atmospheric medicine which could have come

from classical Greece, basing itself on the humoral doctrine and the geographical location, which reached its highest peak in the XVIII century [42]. The first significant measure taken in atmospheric medicine was the Act of Public Health in 1848, but it wasn't until another law was passed in 1875 that some atmospheric factors began to be effectively controlled [43].

In the Instruction for the Economic - Political Government of Provinces, dated 13<sup>th</sup> June 1813, measures and initiatives adopted by the different towns during the XIX century were specified in detail:

*The Police Authorities who are responsible for the local town councils and the health and well-being of the people have the duty to control the cleaning of housing, markets, public squares, hospitals, prisons and charity houses as well as keeping a check on all foodstuffs. Each town must have an adequately located burial ground and care must be taken of stagnant water or contaminated water drainage. To sum up, it must be ensured that nothing in the vicinity of the town alters or affects the health of the population or its livestock in any way [44: 257-258].*

Not many studies are available which outline the evolution of health infrastructure in the towns of the south-west of Extremadura [45, 46, 47, 48], "what is worth outlining is that the knowledge of the history of urban reality is not just a task left to expert researchers of past events, in search of a need to satisfy a huge intellectual curiosity embedded in the general process of promoting historical consciousness. It is a means of getting a closer understanding of today's reality, finding out how things became what they are, in this case, how our towns acquired their current features. In order to understand this, we need to see these towns placed within a corresponding process of formation. It is necessary to observe urban reality as a result of history" [49:82].

The water supply to towns was normally distributed by public sources, situated in the town centre and also wells in the outskirts of the towns [50]. It was a complicated task for towns to control consumption and as a result, there were often periods of drought during the summer season or during other dry spells of weather [51]. The Romans managed to construct an important network in Merida which required large sums of money to keep it going [52].

## Conclusions

The best way of controlling yellow fever is by vaccination but it is also of paramount importance to control the *Aedes aegypti* mosquito to avoid the insect becoming urban. A system of detection through vigilance and control of epidemic breakouts is also crucial. These measures can be difficult to implement in certain parts of the world precisely where the mosquito is active. This is due to its elevated cost, lack of infrastructure, lack of qualified professionals, etc. Epidemics often originate in rural areas, far from urban places which

mean that generally two or three months can easily go by before the epidemic is detected and notified.

There is a lack of global awareness of this disease especially in Africa, and of its devastating economic and social consequences, not only in public health but in the application of the initiatives to control the disease and the lack of interest in applying these initiatives to the disadvantaged communities.

We can expect to find significant outbreaks of viral diseases such as Dengue or Chikungunya in Southern Europe in the coming years. There is also abundant evidence to prove that Malaria is on the rebound. The indigenous transmission, although local and limited to Spain and Europe, is the most concrete proof of this theory, without mentioning the renowned Zika disease transmitted by the same vector; the *Aedes aegypti* mos-

quito, which is currently a major concern for the WHO.

In the light of all this, the appearance of these insects in new ecosystems may give rise to a genetic change which will consequently cause more cases of transmission and serious concern. For this reason, it is extremely important to increase the number of resources and studies related to these viruses, their mechanisms and reproductive cycles as well as promoting the awareness of the need to fight to prevent their propagation.

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