

## Original Synthetic Report

### Psoriatic arthropathy in a 17th century archaeological protestant population belonging to Saint-Maurice cemetery in France.

Djillali Hadjouis

Djillali Hadjouis is a research archaeologist at laboratoire d'Archéologie du Val de Marne, France. Specialized in research paleontology, paleoanthropology and paleopathology bone and tooth, he assures in these three, the direction of several disciplines work research, particularly in the context of training PhD. He is professor of paleoanthropology at Graduate School of Osteopathy in Paris and other academic institution where he teaches a new anthropological interpretation based on Architectural craniofacial and occlusal analysis. Since 2006, He is professor and director of research associated with Centre National de Recherches Préhistoriques Anthropologiques et Historiques of Algiers and contributes to the doctoral training in Algeria. He has published over 130 articles and books.

*Service Archéologie du Val-de-Marne, 7/9, rue Guy Môquet, 94800, Villejuif, France. [Djillali.hadjouis@cg94.fr](mailto:Djillali.hadjouis@cg94.fr)*

**Abstract** - The protestant cemetery of Saint-Maurice as well as what remains of the Charenton Temple (1607-1686) are among the most recently excavated sites of the Val de Marne. The salvage excavation directed by J. Y. Dufour of Institut national de recherches archéologiques préventives (INRAP) in 2005, where a medical facility was built, was instrumental in flagging not only an important 17<sup>th</sup> century protestant cemetery, but also in locating the foundations of the first temple built in 1607, that was the most important reformed church of the French realm. The cemetery is all the more special from an anthropological point of view since its funeral population comes from the Huguenot community of Paris, probably over a period of 80 years from 1606 to 1685 (Dufour & Buquet, 2006). The identification (Dufour, 2001) and the excavation that concerned the western part of the cemetery allowed for the identification of 163 individual burials, one double burial, and seven ossuaries. The funerary, anthropological and pale pathological contexts feature funerary practices related to the protestant cult and a sanitary state that have been rarely studied in a modern era in Northern France. Besides a plague epidemic that appeared as soon as 1636 or even before in the area of the Marne mander, and more precisely in Saint-Maurice, psoriatic arthropathy (or psoriatic arthritis) lesions were diagnosed on the skeletons of an important population that had never been described before. The lesion symptoms of this polyarthritis found on the mobile joints, especially on the interphalangeal articulations are rarely observed because of the preservation of the skeletons.

**Key words** : psoriatic arthropathy, pathology, modern population, 17<sup>th</sup> century, Charenton temple, France

## Introduction

During the analyses carried out in the 1990s on the mummy of Thomas Craven, the hypothesis that his death could be related to the plague epidemic that was rife at the time in Paris according to Dom Félibien was put forward (evacuation of the Conciergerie from September 15 to November 13 1636 and declaration of Thomas Craven's death eight days later) (Hadjouis, 2008). The absence of bone symptoms of the plague bacillus, that are clinical characteristics inherent to some infectious diseases, encouraged further DNA research. The dental sampling done on the embalmed body and on four skeletons from the protestant cemetery, submitted to the biomolecular protocol of the Unité des Rickettsies et Pathogènes émergents de la faculté de médecine de Marseille (Pr. Drancourt) gave positive results of *Yersinia pestis*, thus demonstrating for the first time the presence of the plague in 1636 (in the case of craven) in South-Eastern Paris (Hadjouis & al. 2007 ; Hadjouis & al. 2008).

The embalming process implemented for the preparation of the body of Thomas Craven reveals several plant taxons with absinth (*Artemisia absinthium*) and marjoram (*Oliganum majorana*) predominating. Leaves of holm oak (*Quercus ilex*) or kermes oak (*Q. coccifera*) as well as flower heads of intermediary starwort add to these principal plant ingredients with the presence of hydroliths of pinaceous plants and of amorphous materials suggesting the use of resins. The pollen analysis of a fragment of the shroud showed that the same balsam impregnation process that was used for the internal application was also used for the fabric (Hadjouis & al. 2009, 2011a). Despite a rather poor balsam floristic spectrum, the embalmed corpse of Thomas Craven remains comparable to one of the only studies completed in France, on the body of Anne d'Alegre, countess of Laval, who died in 1619.

Among the other important pathologies that were found in this modern population are osteoarthritis (a degenerative joint disease), rickets and osteomalacia, osteodystrophies, Scheuermann's disease, non specific osteitises, hip and knee malformations, craniostenosis, alveolodental pathologies, trauma and a disease never reported before, psoriatic arthropathy. That last disease, which has been reported for the first time during the 17<sup>th</sup> century, is curiously concomitant with the plague, which also appears for the first time in south-eastern Paris.

## Material and methods

How is the sanitary state of this population and the diseases encountered in the 17<sup>th</sup> century? We have to admit that the presence of many skeletons (26 individuals) in the population of Saint-Maurice, affected by psoriatic arthropathy lesions never reported nor listed in the paleopathological studies of the medieval populations of the Val-de-Marne (six necropolis) not only provides an appreciable amount of new data in the area of South-Eastern Paris, but also raises an issue with the plague epidemic, especially through eventual crossings (Hadjouis, 2010; 2011b).

Arthritis, an inflammatory form of arthropathy, does not occur very often in medieval populations. This dominant osteolytic affection displays a monoarticular (gout), symmetrical polyarticular (rheumatoid arthritis (RA)) or asymmetrical polyarticular (ankylosing spondylites (AS), psoriatic spondylitis or psoriatic arthropathy, spondyloarthropathy) distribution. A good number of the Saint-Maurice skeletons, suffering from inflammatory spondylitis lesions, opens the debate on diagnostic and the post-medieval geographical repartition of the disease. Indeed, the presence of psoriatic arthropathy as a retrospective diagnostic and rheumatoid arthritis as well as Reiter syndrome (spondyloarthropathy) as differential diagnoses in the 17<sup>th</sup> century, and their absence or exceptional character in the Middle-Ages call for particular attention considering the history of the disease. Rheumatoid arthritis is precisely known in France and Europe only from the 18<sup>th</sup> century onwards.

Besides the presence of symmetrical and asymmetrical polyarthritides lesions at the level of the mobile joints, the union of the distal interphalangeal joints of the 4<sup>th</sup> or 5<sup>th</sup> radius, not touching the proximal ones (characteristics of the RA), their deformation or destruction, the presence of juxta-articular microsubchondral cysts, peripheral osteosclerosis on 26 skeletons refers obviously to psoriatic arthropathy. This is usually presented as a complex and uncertain diagnosis, generally by the mere fact of the absence or bad preservation of the small joints of the hand and the foot in the burials. However, in this case, they are remarkably well preserved which is due mainly to its proximity to the modern time.

Though several authors indicated the presence of polyarthritis and, more precisely of rheumatoid arthritis (RA) before the 18th century, others contested the merit of the osteoarchaeological diagnosis. As a matter of fact, it is thanks to the hypothesis of Short (1974), according to which the disease was recently introduced by a genetic mutation of the constitutive elements of the AS, that generalized revisions were carried out on all continents.

As soon as 1988, the work of Rothschild and Woods (1991) on series coming from various regions of the world and linking signs of inflammatory polyarthritis showed that only the new continent exhibited all the unquestionable signs of that disease. The long time presence of this pathology along the length of the Tennessee River, well before the 18<sup>th</sup> century and its introduction in the Old World during that century and after, encourage the authors to suggest the possibility of a viral migration rather than a genetic mutation. For Grmek (1983), we are dealing with an infectious disease due to a slow virus. Today, RA is known as an autoimmune disease which hormonal, environmental, and in particular infectious factors, mainly responsible, but on genetically predisposed individuals.

Nowadays, about 5% of the patients affected by psoriasis suffer from chronic inflammatory rheumatism with negative detection reactions of the rheumatoid factor, called psoriatic arthropathy. Its frequency is different from that of RA, but it the same for both sexes. In 60% of the cases, psoriatic arthropathy is oligoarticular (2 to 4 joints) and concerns mostly the small joints of the hands and feet, but also the bigger joints like the knee. As with rheumatoid arthritis (RA), the arthritis of the members is chronic, deforming and destructive and the ankylosis concerns mostly the distal interphalangeal joints, sometimes the bones of the wrist.

## **Results**

Among the 26 skeletons of Saint-Maurice (see table1), half of them are only represented by the lower limb (220, 133, 295, 297, 329, 215, 218, 209, 243, 339, 354, - 275/300/315/294-, Z1) and their respective diagnosis is based on the bilateral and asymmetrical (or symmetrical) joints of the femurs, tibiae and the tarso-metatarsal ensemble.



Fig. 1. First metatarsus and phalanges of the left foot (burial 353) showing metatarsophalangeal and interphalangeal damage; of note is the distal interphalangeal knitting of the 5<sup>th</sup> radius characteristic of psoriatic arthropathy. © D. Barrau, Service of Archaeology of Val de Marne



Fig. 2. Phalanges of the right foot (burial 352) showing interphalangeal damage; of note the distal interphalangeal knitting of the 5<sup>th</sup> radius and the distal deformation of one of the proximal phalanges characteristic of psoriatic arthropathy. © D. Barrau, Service of Archaeology of Val de Marne

The first essential remark is that the damages to the joints of both sexes, in the adult as well as the young adult, renew themselves with the same symptoms on all 26 skeletons. The most characteristic symptoms are systematically represented by preferential damages : destructive or deforming lesions of the foot phalanges with a predilection of the distal interphalanges, the knitting of the distal interphalanges, and of the interphalanges of the 4<sup>th</sup> and 5<sup>th</sup> radiuses, marginal erosions sometimes with hyperostosis, diaphysis thinning of the phalanges of the foot with a lysis of the extremities, cupule shaping of the phalangeal bases, distal deformation of the phalanges, metatarsophalangeal damages, especially on the first radius (fig. 1, 2, 3). Other less systematized damages are represented by : juxta-articular and metaphysary periosteal reactions, a bilateral *hallux valgus*, inferior and posterior heel pains (talagiae) in relation to enthesopathies of the calcaneal spur, an amalgamating carpalis, carp metacarpal and metacarpophalangeal damages, damages of the shoulder (erosion of the humeral heads), the elbow and the knee (enthesopathies of cruciate muscles et marginal margins).

Table 1. Frequency of the osteoarticular damages of psoriatic arthropathy

	burial	%
Lesions of the C2 dens	135, 299	1.1
Destructive and deforming lesions of the distal interphalanges of the foot	297, 288, 133, 220, 135, 299, 180, 183, 114, 215, 218, 269, 178, (275/300/315/294), 362, 353, 352, 354	10,4
Union of the distal interphalanges of the 4 <sup>th</sup> and 5 <sup>th</sup> radius of the foot	295, 297, 288, 133, 365, 135, 299, 183, 114, 218, 209, 243, (275/300/315/294), 362, 353, 352, 354	9,8

Marginal erosions with or without hyperostosis	288, 135, 178, 352	2,3
Diaphysis thinning of the phalanges of the foot	269	0,5
Cupule shaping of the phalangeal bases	127, 329, 135, 299, 183, 215, 209	4
Distal deformity of the phalanges	328, 180, 183, 215, 218, 243, 269, 362, 352	5,2
Metatarsophalangeal damages	127, 288, 365, 328, 329, 135, 299, 180, 183, 114, 215, 218, 209, 269, 353	8,7
Bilateral <i>hallux valgus</i>	135, 253	1,1
Inferior heel pain	183	0,5
Posterior heel pain	328, 135, 215	1,7
Carpometacarpal damages	127, 288, 328, 299, 178	2,9
Metacarpophalangeal damages	295, 288, 178	1,7
Elbow damage	288, 365, 135,	1,7
Knee damage	295, 288, 328, 329, 209, 178	3,4
Carpitis/arthritis of the hand	288, 299, 127 (Z3)	1,7
Damages of the tarsus	365, 183, 114, 215, 209, 353	3,4
Destructive and deforming lesions of the interphalanges of the hand	328, 178	1,1
Bilateral coxitis	353	0,5



Fig. 3. Phalanges of the right foot (burial 297) showing phalange and interphalangeal damages; of note is the interphalangeal union of the 4<sup>th</sup> radius, the diaphysis thinning and the cupule shaping of the proximal phalange epiphyses characteristic of psoriatic arthropathy. © D. Barrau, Service Archéologie du Val de Marne

The fact that marginal erosions with or without hyperostosis as well enthesopathies are often present with this chronic inflammatory disease is to be emphasized. The numerous ossifications of the musculo-ligamentary of the hind foot (calcaneal exostoses for the heel pain), cruciate muscles of the knee, lesser and greater trochanters and thigh adductors.

In the population of Saint-Maurice, the spinal lesions, characteristic symptoms in the diagnosis of the disease, do not present signs of ankylosing spondylitis. In contrast, the latter is identified on a pelvis which sacroiliac parts (the right side is damaged) (280) are completely unioned (fig. 4), as well as on cervical (C2-C5) and thoracolumbar segments (T11-T12 and L4) (375).





Fig. 4. left half of a pelvis (burial 280) showing the complete union of the pelvic bone to the sacrum, characteristic of ankylosing spondylitis (AS), © D. Barrau, Service of Archaeology of Val de Marne

On the 26 skeletons or parts of skeletons, the retrospective diagnosis of psoriatic arthropathy is shared with a differential diagnosis of rheumatoid arthritis and to a lesser extent spondyloarthropathy (Fiessinger-Leroy-Reiter syndrome), though the latter is linked to a conjunctivo-urethro-synovial syndrome, a reactive arthritis associated to antigen HLA-B27 (*Chlamydia trachomatis bacteria*, salmonellae ...). In other words, due to the good conservation of the lesser articulations of the foot, there are no uncertainties as to the differential diagnosis in the etiological graph. Different from the non-inflammatory arthropathic manifestations, the only close diagnosis is that of rheumatoid arthritis. However, the fusion of the distal interphalanges on more than half of the individuals suffering from psoriatic arthropathy (17 out of 26) leaves no doubt as to the diagnosis when one knows that the interphalangeal damage of the RA concerns only the proximal phalanges.

Among the other important pathologies identified in this modern population, let us mention osteoarthritis (a degenerative joint disease), rickets and osteomalacia, osteodystrophies, cheuermann's disease, non specific osteiteis, hip and knee malformations, craniostenosis, alveolodental pathologies, and trauma. The frequency of these different diseases, especially osteoarthritis of different joints and the metabolic diseases (rickets) are quite more representative than those of infectious diseases which are less frequently represented. Though all these pathologies can also be found during the Middle Ages, the health picture reveals a somewhat different pathocenosis compared to the representativity of the diseases. Their frequency completed by the mingling of the plague and psoriatic arthropathy suggests an epidemiological transfer, probably as early as the beginning of the 17<sup>th</sup> century.

## **Discussion and conclusions**

The excavation of places of worship and their necropolis concern usually medieval or more ancient periods; very few important excavations concerned the modern period. In this regard, the cemetery of Saint-Maurice will serve undoubtedly as an example since the results give it case analysis status in the health arena, at the very least. The 17<sup>th</sup> century pathocenosis indeed reveals for the first time sanitary characteristics from a geographical perspective that encompasses South-Eastern Paris, if not the entire Paris basin area. As such, the presence in Saint-Maurice of two kinds of diseases, one epidemic (plague), the other belonging to inflammatory polyarthritis could be associated for the time in this area. The plague epidemic, recurring in Paris since 1630 and present in the 17<sup>th</sup> century as early as 1619, shows for the first time in Northern France its bacteriological diagnosis (*yersina pestis* according to DNA) on the archaeological excavation data.

However, the presence of a great number of skeletons (26 individuals) in the population of Saint-Maurice suffering from psoriatic arthropathy lesions that have never been mentioned in the archaeological populations of northern France, even all over France, provides not only non-negligible new data in the area, but also raises issues with the plague epidemic, especially by eventual crossings.

The retrospective diagnosis of osteoarchaeological lesions of inflammatory polyarthritis and more particularly of psoriatic arthropathy is infallibly accompanied by the differential diagnosis of rheumatoid arthritis, especially in individuals with a cervical spine which lesions of the C2 dens are characteristic of that disease.

Curiously enough, the apparition of the disease in the area, probably as early as 1600, coincides with the first marks of a plague epidemic that were found on the embalmed body of Thomas Craven whose death dates back to November 26, 1636. Until such time when new osteoarchaeological data are available, one might consider this date as the first instance that could be correlated with the arrival of polyarthritis in the Parisian Basin.

The parallelism raised here between an epidemic disease and inflammatory polyarthritis, is not new. Several authors, Gmerk (1983) first of them, mentioned that link but rather with rheumatoid arthritis and suggested the possibility that rheumatoid arthritis could be an infectious disease, the origin of which would be a lentivirus or any other bacteriological vector. For Thillaud (1996), RA is an immunological disease developed in relation with a human retroviral infection. But what to say about an inflammatory polyarthritis such a psoriatic arthropathy and the crossed reactions with an epidemic disease? At first sight, it appears that the presence of both diseases (plague and PA) in the 17<sup>th</sup> century is as unusual as before this period. And the inventory of diseases compiled in this department since the Neolithic reveals a corpus of specific osteotitises (treponemal (two to three cases), tuberculosis (two cases)), and non specific osteotitises (osteomyelitis, periostosis ...), degenerative, metabolically and neurological diseases and a complete absence of leprosy and any other epidemic disease.

### ***Acknowledgements***

The author wishes to thank Adeline Demouy and Carl Martel for the translation.

## References

Drancourt M, Aboudharam G, Signoli M, Dutour O, Raoult D. 1998. Detection of 400-year-old *Yersinia pestis* DNA in human dental pulp: an approach to the of ancient septicemia. *Proc. Natl. Acad. Sci. U S A.* 1998 Oct. 13;95 (21):126 37-40.

Dufour J-Y., 2001. Saint-Maurice (Val-de-Marne). Cimetière des Huguenots parisiens sous l'édit de Nantes (XVII<sup>e</sup> siècle). Document Final de Synthèse, 43 p.

Dufour J-Y, Buquet C. 2006. Temple et Cimetière Huguenot de Charenton à Saint-Maurice. *Clio94.* 24, pp 123-129.

Grmek, M. 1983. Les maladies à l'aube de la civilisation occidentale. Payot, Paris, 527 p.

Hadjouis D. (2008). La peste aux portes de Paris , *Archéologia*, 460, 52-60.

Hadjouis D., Lavu D., Aboudharam G., Drancourt M., Andrieux P. 2006-2007. Présence de la peste (*Yersinia pestis*) dans le cimetière protestant de Saint-Maurice (Val-de-Marne, France). Archéologie et microbiologie. *Paleobios*, 14, Lyon-France, [http://anthropologie-et-paleopathologie.univ-lyon1.fr/PALEOBIOS2006/Présence\\_de\\_la\\_peste\\_version\\_finale.htm](http://anthropologie-et-paleopathologie.univ-lyon1.fr/PALEOBIOS2006/Présence_de_la_peste_version_finale.htm) , pp. 1-7.

Hadjouis, D., Lavu D., Aboudharam G., Drancourt M., Andrieux P. 2008. Thomas Craven, noble anglais mort de la peste en 1636 à Saint-Maurice (Val-de-Marne, France). Identification et détermination de la cause de la mort par l'ADN. *Biom. Hum. et Anthropologie*, 26, 1-2.

Hadjouis, D., Corbineau, R. 2009. Analyses d'une momie du XVII<sup>e</sup> siècle d'un protestant anglais mort en 1636 (Saint-Maurice, Val de Marne). *Rencontre autour des sépultures habillées*, Carry-le-Rouet (Bouches-du-Rhône), 13-14 novembre 2008, p. 128-135.

Hadjouis, D., en collaboration avec Dufour, J.Y. et Bucquet, C. 2010. Mouvements de populations et paléo-épidémiologie au XVII<sup>e</sup> siècle dans le Sud-Est parisien : L'exemple du cimetière protestant de Saint-Maurice (Val-de-Marne), résumé des Actes du colloque de Créteil *Dynamique des peuplements, modes d'habitat et influences culturelles dans le Sud Est de Paris du Néolithique ancien à la période moderne*.

Hadjouis, D., Corbineau, R., Ruas, M.P., Verdin, P. (sous-presse, 2011a). Techniques d'embaumement sur le corps d'un noble anglais mort de la peste (Saint Maurice, Val de Marne), *In. Actes du 3<sup>e</sup> colloque international de pathographie*, 3-5 avril 2008, Théâtre de Bourges.

Hadjouis D. (2011b). Paléopathologie des squelettes de Saint-Maurice. Cimetière protestant du XVII<sup>e</sup> siècle. Rapport pour le DFS de J-Y. Dufour, 73 p.

---

Rothschild, B.M., et Woods, R.J., 1991. Spondylarthropathy : Erosive arthritis in representative defleshed bones, *A.J.P.A.*, 85, 125-134.

Ryckewaert, A., 1987. *Rhumatologie. Pathologie osseuse et articulaire*. Flammarion, Paris, 492 p.

Short, C.L., (1974), The antiquity of rheumatoid arthritis, *Arthr. Rheum.*, 17, 193-205

Thillaud, P., 1996. *Paléopathologie humaine. Traités pratiques d'Archéologie*. Kronos éditions, Sceaux, 238 p.