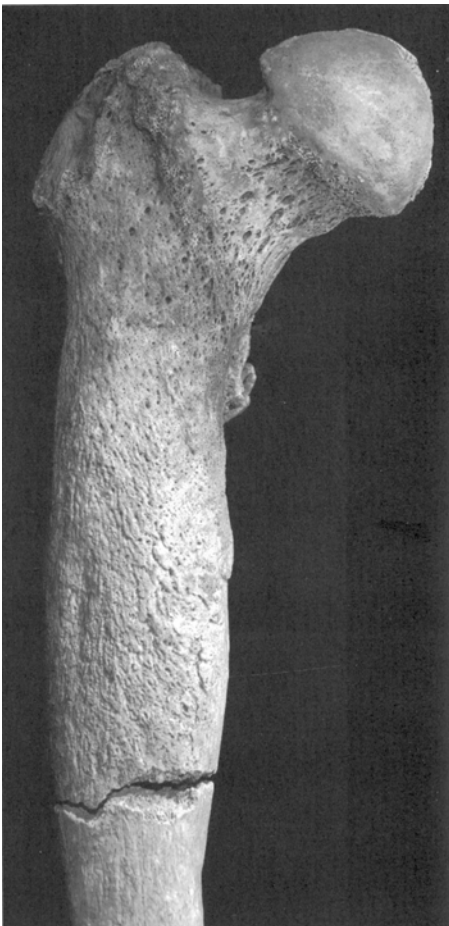


## What have we learnt about Paget's disease of bone from studying ancient skeletons?

Dr. Simon Mays, Skeletal Biologist, English Heritage

- A great many ancient skeletons have been excavated from archaeological sites around the world. For example, there are over 80,000 skeletons from archaeological sites kept in museums in Britain alone.

Ancient skeletons form an important resource for research on disease. This not only tells us something about the health of our forebears but also helps shed light on diseases that continue to trouble us today.



- The study of Paget's disease of bone (PDB) in ancient human remains has a long history. The first purported case in an archaeological skeleton was published in 1889; only 12 years after Sir James Paget first described the disease. However, many of the older publications describing PDB in ancient skeletons are rather dubious as early diagnosis relied mainly or entirely on the gross appearance of the bones. Although the bone in PDB is thickened and pitted (Fig. 1), this is an appearance which may be shared by other diseases of bone.

*Fig. 1 - The top of this femur (thighbone) is pitted and thickened. Radiography confirmed a diagnosis of Paget's disease of bone.*

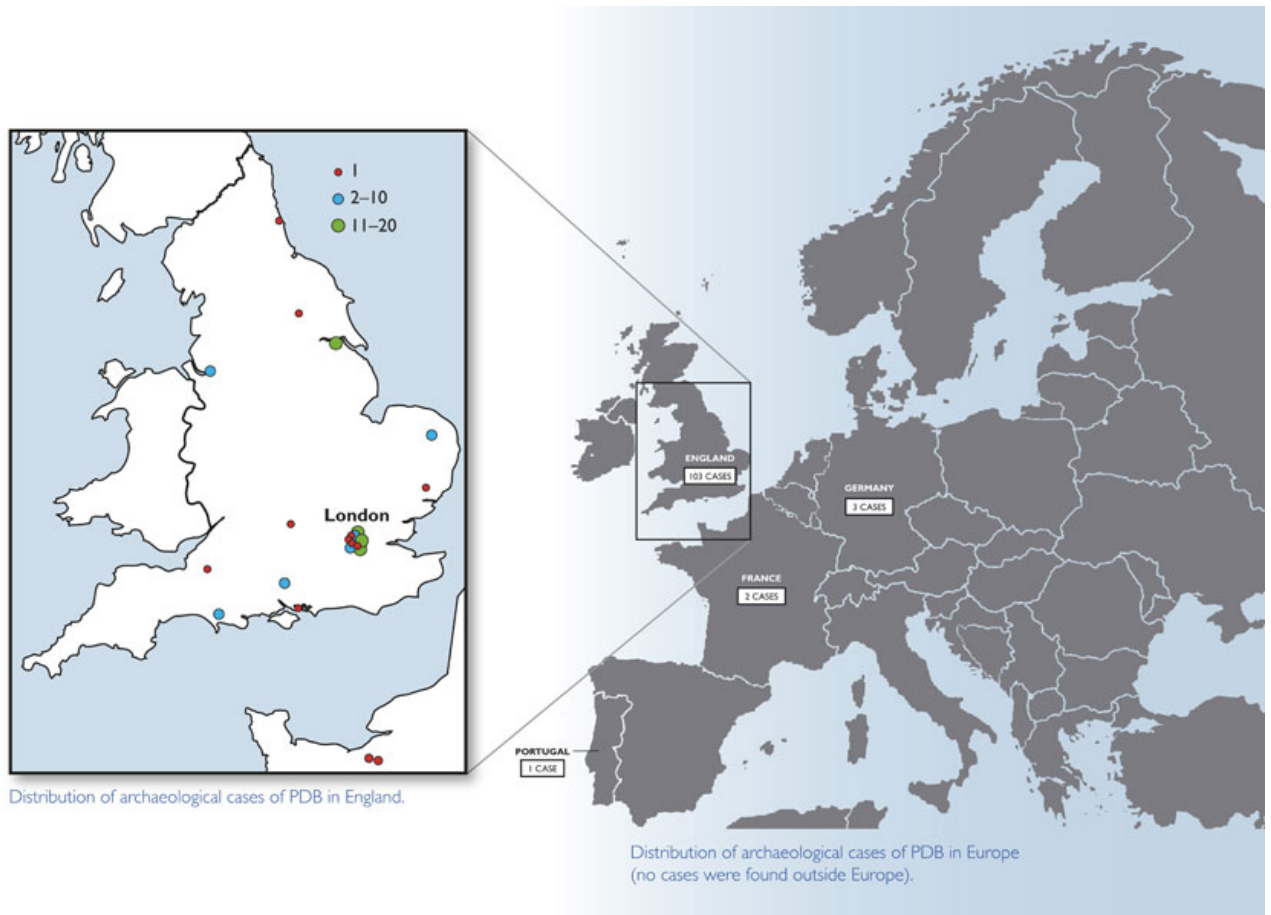


- The X-ray appearance and the microscopic structure of the Pagetic bone are highly distinctive and radiography and / or microscopy enables PDB to be accurately diagnosed in archaeological skeletons (Fig. 2).
- I conducted a literature review of cases of PDB from archaeological skeletons from around the world, published from 1889 to the present, in order to try and summarise what we have learnt about PDB from their study.

*Fig 2 - Radiographic view of a tibia (shin bone) of a mediaeval burial of an elderly man from Ipswich. The arrow marks the boundary between diseased bone (above) and normal bone (below). The rather mottled appearance of the diseased area is characteristic of PDB. Part of the middle of the bone is missing due to poor survival of the remains in the soil.*

## FINDINGS

- When the criteria of firm chronological dating along with acceptable radiographic or microscopic diagnosis are applied there are a total of 109 archaeological cases. There are no cases come from outside Western Europe, and 94% come from England (Fig 3).



*Fig 3 - Distribution of archaeological cases of PDB (no cases were found outside Europe).*

- The English cases show no particular geographical distribution – for example, there is no evidence for the concentration of cases in Lancashire seen in recent times, however relatively few archaeological skeletons have been excavated from that area. Most of the archaeological cases come from London, due to the large number of cemetery excavations that have been carried out in the city.

- Evidence also suggests that in the past, neighbouring communities sometimes showed very different frequencies of PDB. At Barton-upon-Humber Mediaeval cemetery in north Lincolnshire (where over 2500 burials were excavated), the prevalence of PDB among those who died past middle age was 2.3%, whereas in another large Mediaeval cemetery, Wharram Percy, which lies only 50km away in Yorkshire, PDB was absent. That this difference should exist between two communities in close proximity echoes the situation seen in PDB frequency today where prevalence may vary considerably between towns less than 100km apart.
- At one burial site, Norton Priory in Cheshire, there was a very high prevalence of PDB (10% of skeletons were affected). The location of the burials suggested that they might have been members of an important family who gave money to the priory, so a familial predisposition might explain the concentration of the disease here.
- Today, PDB is most frequent in populations of British origin, and this has led to the suggestion that the disease originated in Britain and was spread around the world in recent times by migration of British populations. The archaeological evidence would seem to be consistent with this idea.
- The earliest cases of PDB date from the Roman Empire (Table 1). Most cases though are Mediaeval (or later) in date, but this may reflect the fact that we simply have more skeletons from these periods.

Table 1. PDB cases by archaeological period

Period	Country			
	England	Germany	France	Portugal
Roman Empire (1-400AD)	7		1	1
Anglo-Saxon (400-1066AD)	7			
Mediaeval (1066-1538AD)	52	3	1	
Post-Mediaeval (1538-1850)	37			
TOTAL	103	3	2	1

- The sex ratio of archaeological skeletons with PDB was 2.4: 1 in favour of males. A male preponderance is also seen in modern PDB patients.

- As today, some ancient cases of PDB show complications. There are several archaeological cases with pathological fracture (Fig 4), and one shows evidence of an osteosarcoma.



(4a)



(4b)

*Fig 4. (a) The femur from the same individual as Fig. 2. The bone is clearly Pagetic and shows a fracture (arrowed) which occurred in life but which failed to unite before death. (b) The broken ends show some remodelling (smoothing) indicating that the man survived the fracture for only a short period of time.*