



Family graves? The genetics of collective burials in early medieval southern Germany on trial

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ABSTRACT

Simultaneous collective burials appear quite regularly in early medieval linear cemeteries. Despite their relatively regular occurrence, they are seen as extraordinary as the interred individuals' right to be buried in a single grave was ignored for certain reasons. Here, we present a study examining the possible familial relationship of early medieval individuals buried in this way by using aDNA analysis of mitochondrial HVR-I, Y-STRs, and autosomal miniSTRs. We can show that biological relatedness may have been an additional reason for breaking the usual burial custom besides a common cause of death, such as the Plague, which is a precondition for a simultaneous burial. Finally, with our sample set, we also see that signs of interaction between individuals such as holding hands which are often interpreted by archeologists as signs of biological or social relatedness, do not always reflect true genetic kin relationships.

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1. Introduction

Since the late Roman times people in central Europe usually buried their deceased in single graves in accordance with their respective burial customs (e.g. orientation of the bodies, clothing of the dead, grave architecture), while the burial of several individuals in one common grave has always been seen as an exception to the rule due to the deviation from the normal burial rite (Lüdemann, 1994).

In 5th to 7th century Bavaria the dead were also usually buried in single earth graves on common burial grounds, the so-called linear cemeteries (*Reihengräberfelder*), and equipped with grave goods corresponding to their sex, age and social position (Kokkotidis, 1999). The dead were laid to rest in W-E orientation and in a supine position. Yet, in some cases, one grave can yield two or more individuals who were interred simultaneously. Such a kind

of grave is called “collective burial” which by definition means the simultaneous burial of several individuals in one grave (Lüdemann, 1994).

Although not very frequent, collective burials appear quite regularly in early medieval times over several centuries and both females and males of all age categories may be grouped together. Possible reasons for burying two or more individuals together in one grave at nearly the same time are manifold and frequently discussed in archaeology (summary in Lüdemann, 1994). Besides economic reasons, such as time saving or postponement of burials due to bad climatic conditions followed by interment in collective burials, the simultaneous death of several individuals is the most frequently assumed precondition for this phenomenon.

Since a death close in time does not necessarily have to lead to a burial of individuals in a common grave, it is assumed that a common cause of death may play a role in the layout of collective burials (e.g. Wahl, 1994). While the well-known mass burials containing dozens of individuals in later times have long been recognized as potential repositories of victims of infectious diseases (McCormick, 2007; McCormick, 2015), it has recently been shown that also a higher prevalence of “smaller” collective burials

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containing just two to five individuals, may hint at epidemics such as the Plague (Harbeck et al., 2013).

With these “smaller” collective burials it could also be shown that *Yersinia pestis* was causative of the Justinianic Plague and that this early medieval epidemic also had reached Bavaria in the mid-6th century AD (Feldman et al., 2016; Wagner et al., 2014; Harbeck et al., 2013).

An additional reason for a collective cause of death of several individuals is seen in the early medieval feud system, an early medieval system of blood vengeance. This is often used as an explanation for collective burials of men (e.g. Schneider, 2008; Steuer, 2008).

However, a simultaneous death may have been only one precondition for the interment of several persons together in one collective grave but not necessarily the only reason. It is still likely that individuals, even when dying a simultaneous death, were buried separately if not a further bond existed between them.

Biological family ties are often seen as additional justification for collective burials, especially when adults are buried together with children. It is then usually assumed that the individuals resemble members of a nuclear family, i.e. (grand-)parent-(grand-)child or siblings. These interpretations are strengthened by body positioning in the grave, signs of “communication” between the dead, such as holding hands or facing each other, are usually interpreted in that sense (Lüdemann, 1994; Schneider, 2008; Gutsmedl-Schümann, 2010). Yet, not much is known about social organization of 5th to 7th century Bavaria and inferences can only be made from a legal text, the so-called *Lex Baiuvariorum* which dates back to the second half of the 7th century AD (Steuer, 1989; Landau, 2004). From this text it is known that the *familia* not only comprised the nuclear, i.e. genetically related, family members but also friends and servants of a particular manor (Steuer, 1989). Adoptions and godparenthoods have also been known (Schneider, 2008).

To answer the question if biological relationships are an additional cause for common graves besides a simultaneous death, we sampled and genetically analyzed material from early medieval collective burials from different contexts (Plague burials, alleged interpersonal violence). Although archaeological data may be in support of family burials, i.e. genetically related individuals, and such an assumption may therefore be tempting, only genetic evidence offers the potential to finally prove or disprove such a hypothesis.

Technological and methodological advances in recent years now allow us to produce reliable data from archaeological skeletal material when appropriate quality and security measures are applied (Burger and Bollongino, 2010; Cooper and Poinar, 2000; Fulton, 2012; Wiechmann et al., 2012).

2. Materials

The linear cemetery of Altenerding-Klettham (hereafter referred to as Altenerding; AE) is by now one of the largest early medieval graveyards in Bavaria comprising more than 1400 excavated burials (Sage, 1984; Paffgen et al., 2016). The site is located north-east of Munich (Fig. 1) and was excavated between 1966 and 1973. Unfortunately, a huge part of the graveyard was destroyed prior to any excavation work and therefore not all of the burials could be recovered. From these 1400 burials at least 18 are double burials (Losert, 2003) most of which date to between the mid-6th and early 7th century.

The site of Aschheim-Bajuwarenring (hereafter referred to as Aschheim; A) is located between Munich and Altenerding (Fig. 1). At Aschheim 430 inhumations were excavated. An unknown part of the cemetery was only recently destroyed in the 19th century (Gutsmedl-Schümann, 2010). Overall, 23 double, four triple, one

quadruple and one quintuple burial could be recovered (Gutsmedl-Schümann, 2010).

Following Lüdemann (1994), the simultaneity of the selected burials was determined by the fact that the bodies or coffins were buried on the same level, i.e. with no traces of a re-opening of the graves or overlapping of burials (Fig. 2). In the most obvious case, the individuals within a collective burial were buried in a shared coffin.

To address the phenomenon of early medieval collective burials, we selected 13 collective burials from these two early medieval Bavarian burial sites. Eleven of these burials were collective burials in which between two and five individuals were laid to rest simultaneously, while in the remaining two burials a second individual was buried atop of one individual after some time had elapsed (so-called successive burials). Of the simultaneous burials nine graves are proven or potential (due to contemporaneity) Plague burials (Feldman et al., 2016; Harbeck et al., 2013) and one grave is attributed to interpersonal violence against the background of the early medieval feud system (Schneider, 2008). The remaining simultaneous and the two successive burials did not reveal hints on their individuals' cause of death.

Twenty individuals from ten double burials were chosen from Altenerding (7 female, 6 male, 7 indeterminate; of these 11 were at least adult and 9 were subadult), while 12 individuals from a triple, a quadruple, and a quintuple burial (6 female, 3 male, 3 indeterminate; of these 8 were at least adult and 4 were subadult) from Aschheim were selected, summing up to a total of 32 individuals. Table 1 gives an overview of the individuals and how they are organized in graves. Burials included in this study were chosen for sampling according to their macroscopic state of preservation and with regard to their combination of individuals. We tried to cover all possible cases of individuals of different age and sex buried together in one grave (Table 2). Thus, with the exception of the combination ‘woman-child’, not all cases of a certain combination of individuals from Altenerding could be included in the study. Morphological data of the selected individuals have been published in Sage (1984) for Altenerding and in Staskiewicz (2008) and Gutsmedl-Schümann (2010) for Aschheim. While only double burials were available from Altenerding (Fig. 3), for Aschheim it was possible to also sample bigger collective burials, some of which seem to resemble a classical nuclear family, i.e. parents and their children (Gutsmedl-Schümann, 2010). In some of the burials presented here the individuals were arranged in the grave to show some relation to each other. Thus, they were either laid to rest holding their hands or facing each other. These signs which are believed to indicate (biological) kin relationships (Lüdemann, 1994; Schneider, 2008; Gutsmedl-Schümann, 2010) are referred to as “communication” in Table 1. One burial from Altenerding (AE 887 – AE 888) has previously been put into the context of the early medieval feud system (Schneider, 2008).

Additionally, all of the burials included in this study have previously been tested for the presence of *Yersinia pestis* (Table 1), a pathogen that could be shown to be the causative agent of the so-called Justinianic Plague which also reached 6th century Bavaria (Feldman et al., 2016; Wagner et al., 2014; Harbeck et al., 2013).

3. Methods

We examined potential genetic relations between people buried together in one grave by analyzing mitochondrial hypervariable region I (HVR-I), Y-chromosomal short tandem repeats (Y-STRs), and autosomal STRs. While mitochondrial DNA (mtDNA) and Y-STR analyses allow for the detection of genealogies also over longer time periods, the analysis of autosomal STRs has the potential to determine exact kin relationships (Butler, 2010) if ancient DNA

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