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Food for Rome: A stable isotope investigation of diet in the Imperial period (1st–3rd centuries AD)

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ABSTRACT

During the Empire, the population of Rome was composed mostly of lower-class free citizens and slaves. Viewed from historical records, the Roman diet included primarily olives, wine, and wheat, but poor and enslaved Romans may have eaten whatever they were able to find and afford, leading to significant heterogeneity in the Roman diet. Previous carbon and nitrogen isotope analyses of skeletons from Imperial Italy have begun to reveal variation in diet, but little is known about what people ate in the capital city. This study complements previous work by adding new isotope data from human skeletons found in two Imperial-period (1st–3rd centuries AD) cemeteries in Rome. These data suggest that urban and suburban diets differed, most notably in the consumption of the C_4 grain millet. Comparing these new data with all published palaeodietary data from Imperial Italy demonstrates that significant variation existed in the diet of the common people.

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Introduction

During the Empire (1st-5th centuries AD), the population of the city of Rome was divided into different social strata. Less than 2% of people were counted among the upper strata of society–those who controlled the government, religion, and economy of both Rome and the Empire–while about 98% of the Roman population was composed of the non-elite–the commoners, slaves, and freedpeople whose social, economic, or legal status prevented them from joining the upper ranks (MacMullen, 1974; Alföldy, 1985; Bradley, 1994; Scheidel, 1997).

In spite of the fact that the vast majority of the population of Rome would have been among the lower socioeconomic strata and perhaps one-third of that population was composed of slaves (Noy, 2000; Scheidel, 2004), the diet of the people of Rome has not been thoroughly investigated. For example, primary sources lay out the contents of the ancient Roman diet, but these histories, novels, and art were produced by and for the upper class, meaning the diets they portray were likely not representative of what the average inhabitant of Rome ate (Garnsey, 1999; Prowse, 2001; Alcock, 2006; Cool, 2006). Scholars have started to realize that understanding the Roman diet is complicated by an elite bias as well as by factors such as sex, age, occupation, and social class (Beer, 2010; Garnsey, 1999; Purcell, 2003; Wilkins and Hill, 2006).

There is little textual evidence of the diet of the lower classes of Rome, although Cato the Elder suggests in *de Agricultura* (160 BC) that slaveholders provide each of their farmhands with certain rations: four *modii* (roughly 26 kg) of wheat and half a liter of olive oil each month; olives, salt, or fish pickle as a condiment; and 42 gallons of wine per annum (White, 1976). The most common grain consumed was wheat (Garnsey, 1999), and in Imperial Rome, the grain dole provided 5 *modii* (roughly 33 kg) of wheat per month to each male citizen (Garnsey and Rathbone, 1985; Garnsey, 1988, 1991). This wheat, however, was unmilled, meaning many people were likely not taking advantage of the dole for lack of resources to process the grain (Spurr, 1983; Sippel, 1987; Garnsey, 1991). An alternative to wheat was millet, which grows easily and cheaply in Italy, but which was often viewed as a substandard grain (Evans, 1980; Spurr, 1983, 1986; Nenci, 1999). A wide variety of vegetables, fruits, and nuts were eaten. Particularly popular in rural areas according to historical sources like Pliny, legumes in the form of lentils, chickpeas, broad beans, and garden peas could be eaten on their own or in a mixture with millet or wheat (Faas, 1994; Garnsey, 1999; Evans, 1980; Spurr, 1983). The role of legumes in the diet of lower-class residents of Rome and rural inhabitants of Italy, however, is still being debated (Garnsey, 1991, 1999).

Our knowledge of the kind and amount of meat consumed by the average inhabitant of Rome is sparse, in spite of the importance of the livestock trade to the Roman economy (Kron, 2002; MacKinnon, 2004). Sources of meat included goat/sheep, poultry, and fish, but probably little beef, and consumption of pork and

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other meats increased in the early Empire (White, 1976; Brothwell, 1988; Brothwell and Brothwell, 1998; Garnsey, 1999; MacKinnon, 2004). Patterns of fish consumption in ancient Rome are particularly unclear, as this category of animal was alternately seen as a threat to seafaring and as a common food; sometimes expensive and sometimes easy to procure; a luxury item in the form of *garum* (fish sauce) and a food of the common fisherman, all depending on the time period in history, a person's social status and occupation, and a variety of other contextual factors (Purcell, 1995; Beer, 2010).

Analysis of the stable isotopes of carbon and nitrogen has been used for decades to characterize human diets in the past because it provides a way to generalize the types and amounts of proteins and plant matter an individual consumed (Katzenberg, 2008), making it ideal for answering questions about the ancient Roman diet. Carbon isotope ratios measured in bone collagen ($\delta^{13}C$ or $\delta^{13}C_{co}$) mainly indicate the protein component of the diet (Krueger and Sullivan, 1984). The measurement of carbon isotopes in bone apatite ($\delta^{13}C_{ap}$) provides a picture of dietary energy, including carbohydrates and lipids (Katzenberg, 2008). Stable carbon isotope analysis is often used to distinguish a diet based on C_3 plants–temperate grasses such as wheat and barley–from C_4 plants, including millet and sorghum. Plotting $\delta^{13}C_{co}$ versus $\delta^{13}C_{ap}$ provides an additional dimension to the carbon isotope data by elucidating an individual's dietary energy source (C_3, C_4, or mixed) and protein source (C_3, C_4, or marine) (Kellner and Schoeninger, 2007).

In environments where a population was utilizing both aquatic resources (freshwater fish or seafood) and C_4 plants, however, it can be difficult to understand the diet based on carbon isotopes alone (Larsen et al., 1992). Stable isotopes of nitrogen better discriminate between aquatic and terrestrial protein (Schoeninger et al., 1983; Katzenberg, 2008). Understanding nitrogen isotopes involves knowledge of an organism's trophic position in the food chain. An increase in trophic level is known to correlate with an increase in $\delta^{15}N$ value. Body tissues are generally 3–4‰ higher than the $\delta^{15}N$ of the diet (Schoeninger and DeNiro, 1984), but the relationship between aquatic protein consumption and human $\delta^{15}N$ value is not completely straightforward (Hedges and Reynard, 2007). Measurement of both $\delta^{15}N$ and $\delta^{13}C$ values has also been used to understand breastfeeding and weaning in past populations (Katzenberg et al., 1996; Fuller et al., 2006; Katzenberg, 2008). Breastfeeding infants consume the product of their mothers' body tissues and therefore occupy a higher trophic level than adults and weaned children. Studies have shown that nursing infants, compared to their mothers, have a ^{15}N enrichment of about 2–3‰ and a ^{13}C enrichment of about 1‰ (Fogel et al., 1989; Fuller et al., 2006).

Carbon and nitrogen isotope measurements of individuals from Imperial Rome can thus provide information on diet within the population, which might differ based on sex, age, or status. Palaeodietary isotope analysis is still a new methodology in the Roman world, particularly in Italy. Two previous studies that have been done in the suburbs of Rome illustrate a general diet composed of cereals and some aquatic resources with regional variation. The largest palaeodietary study was done at Isola Sacra (1st–3rd centuries AD), the cemetery associated with the city of Portus Romae, about 25 km southwest of Rome on the Tyrrhenian Sea (Prowse, 2001; Prowse et al., 2004; Prowse et al., 2005; Prowse et al., 2008). Isotope analyses of the Isola Sacra sample showed that people living on the coast consumed aquatic resources and that diet varied with age. The early Christian necropolis of St. Callixtus (3rd–5th centuries AD) near Rome has yielded lower-than-expected $\delta^{13}C$ values (Rutgers et al., 2009), which the authors interpret as possible evidence for the consumption of freshwater fish from the Tiber River. Additionally, a large study done at the Imperial site of Velia, 400 km south of Rome on the Tyrrhenian coast, revealed a diet high in grain but low in meat and aquatic protein; males at the site may have been eating more aquatic prestige foods, however (Craig et al., 2009).

Our analysis focuses on two cemeteries from the city of Rome itself and represents the first dietary study of individuals who lived in Rome during the middle Imperial period. In this study, we report the results of stable carbon and nitrogen isotope analyses of bone samples from two Imperial-period sites located just outside the city walls of Rome: the cemeteries of Casal Bertone and Castellaccio Europarco. Burial style and lack of grave goods suggest the individuals buried at these two sites were from the lower strata of Roman society (Toynbee, 1971; Musco et al., 2008; Buccellato et al., 2008), but differences in grave form at Casal Bertone suggest socioeconomic variation within that population. These average inhabitants of the city and suburbs of Rome likely had inconsistent access to high-quality and high-status food, leading to significant variation in the diet. Specifically, with this stable isotope palaeodietary study, we aimed to explore: (a) differences in diet within and between the periurban Casal Bertone sample and the suburban Castellaccio Europarco sample; (b) age- and sex-related variation in diet; and (c) patterns of resource consumption among Imperial-period people living within the Italian peninsula and the *suburbium* of Rome.

Materials and methods

Roman sites and the suburbium

The city of Rome was not a monolithic, spatially distinct area of Italy, as the *suburbium*, a term that literally means below or outside the walls of Rome, stretched up to 50 km from the city walls (Quilici, 1974; Champlin, 1982; Witcher, 2005). It was a liminal area, neither rural nor urban, that included marginal businesses excluded from the city for religious or public safety reasons, such as slaughterhouses, brick-making facilities, quarry pits, landfills, and cemeteries (Witcher, 2005). Archaeological field surveys suggest that population density within the *suburbium* was high, holding about one-third of a million people (Morley, 1996; Witcher, 2005). A peak in both suburban and urban populations during the Imperial period would have put great pressure on the *suburbium* and its lower-class residents to accommodate additional housing, cemeteries, and people, stretching thin finite resources such as money and food (Carafa et al., 2005).

Samples in this study come from skeletons buried in two Roman cemeteries. The periurban cemetery of Casal Bertone (2nd–3rd centuries AD) was located 1.5 km from the walls of Rome along the ancient *via Praenestina* (Fig. 1). Excavations from 2000–2003 were salvage in nature and uncovered an above-ground mausoleum with niches for single and multiple burial, as well as a necropolis with simple inhumations in pits and in *cappuccina*-style graves (Nanni and Maffei, 2004; Musco et al., 2008). In 2007, a large industrial complex was uncovered just meters from the cemetery, representing either a fullery or tannery, along with an associated residential area (a *villa*) (Musco et al., 2008). Out of a total of 138 individuals, we selected for isotope analysis a demographically-stratified sample of 36 individuals whose age and/or sex could be confidently estimated–24 from the necropolis and 12 from the mausoleum. Castellaccio Europarco (1st–3rd centuries AD) is a rather haphazard burial area near a wall that flanked the ancient *via Laurentina*, almost 12 km from Rome (Fig. 1). In 2003, excavators found a villa, the burials, and a large storage building (Grandi and Pantano, 2007; Buccellato, 2007; Buccellato et al., 2008). Out of the 48 Imperial-period burials, we analyzed the carbon and nitrogen isotopes in a demographically-stratified sample of 12 individuals whose age and/or sex could be confidently estimated.

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