



**DARK AGES? DIACHRONIC VARIATION IN HEALTH STATUS,
LIFESTYLES AND DIETARY HABITS:
LEOPOLI-CENCELLE BETWEEN EARLY AND LATE MIDDLE AGES
(9TH-15TH CENTURIES CE; VITERBO, ITALY)**

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The present research aims at a diachronic analysis of the variation in human lifestyle from Early to Late Medieval period in Central Italy, turning the attention to mortality patterns, epidemiological regime, and dietary habits by using an integrated multidisciplinary approach combining skeletal biology, stable isotope analysis from bone proteins, metagenomic and metaproteomic analyses of dental calculus.

Despite the huge complexity of the Medieval period and the associated changes in social, religious, political and economic organization¹, there is a general lack of knowledge about the impact on population dynamics and, moreover, the available information is rarely focused on single populations with a continuity of life from Early to Late Medieval period. The demographic variations observed in Medieval populations are traditionally explained by the pattern of social decay associated to the Early period followed by improved life conditions in Late Medieval times^{2,3}.

The skeletal series from Leopoli-Cencelle, showing a continuity of life for six centuries, represents a unique model study in the Italian and European scenario to gain knowledge on the long-term evolution of the Medieval period in Italy because of the large sample size, the extensive presence of material data, and a well preserved archaeological context witnessing its abandonment at the end of the 15th century due to the lure of alum industry in the neighbouring area of Tolfa. The skeletal series counts so far a total of 877 individuals, whereof 656 (329 non-adults, 327 adults) with known sex and age at death. The morphological examination will focus on the prevalence of non-specific stress markers (e.g. *cribra orbitalia* and *cribra cranii*, tooth enamel hypoplasia), and diseases. Dietary patterns will be investigated integrating carbon and nitrogen stable isotope analyses from bone proteins with DNA shotgun sequencing and mass spectrometry-based proteomic analysis of dental calculus samples. Proteins will be extracted from 200 individuals, the obtained isotopic ratios will constitute the groundwork of different statistical models to estimate the contribution of different food fractions as well as their correlation with demographic parameters. A total of 60 dental calculus specimens will be sampled from individuals suffering from dental pathologies (N=40) and from healthy controls (N=20) for metagenomic and metaproteomic analyses. These highly informative approaches will also allow characterizing the oral microbiome providing the chance to extend the downstream analysis to functional metagenomics and metaproteomics information.

The outcome of this project may shed lights on overlooked biased aspects of the complexities of the Medieval period as well as of the transition between Medieval and post-Medieval times providing a better understanding of an interesting page of our past history.



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2. Pinto, G. (1997). *L'Italie*, In *Histoires des populations de l'Europe, I Des origins aux prémices de la revolution démographique*, J.P. Bardet, and J. Dupâquier, eds. (Paris: Fayard), pp. 105-129.
3. Barbiera, I., and Della Zuanna, G. (2009). *Population Dynamics in Italy in the Middle Ages: New Insights from Archaeological Findings*. *Population and Development Review* 35, 367-389.