SOCIAL STRATIFICATION AND DIFFERENTIAL ACCESS TO MEAT THROUGH TRACE ELEMENT ANALYSIS

ABSTRACT: Since differential access to food resources, specially meat, can be the consequence of a great social stratification, we might expect to find some correlation between status and dietary indicators, such as trace elements bone content. The spatial distributions of human remains in two archaeological sites from Spain seem to reflect an intentional use of the available area. The studied sites are the Paleochristian Basilica of Ceuta and the medieval church of L’Esquerra. Zn/Ca site distribution suggests that, in the studied sites, social stratification might have influenced funerary rituals. The use of diet as a social status indicator needs, though, close relationship among archaeological, historical, ecological, and anthropological data.

KEY WORDS: Zinc — Strontium — Bone — Atomic absorption — Archaeological organization — Social organization — Spain.

INTRODUCTION

Trace elements in bone may be used for determining the importance of the different food types in the diet. The analysis of Strontium (Sr) and Zinc (Zn) has proved to be a useful indicator of vegetable and meat intake (Buikstra et al. 1989, Schöning 1989, Iyikan 1989, Lambert et al. 1985, Sillen and Kavanagh 1982, Schöning 1982, Fornaciari and Mallegni 1987, Pérez-Pérez 1990). Since differential access to food resources may be influenced by social status, the study of diet might give information on social organization of past human groups. Differences, though, seem to be slight in modern hunter-gatherer groups, while they can be large in historical, highly stratified populations.

In certain instances, trace elements not directly related to diet, such as Lead (Pb), show social correlates (Ascherheide et al. 1981, 1985). Other elements content in bone, heavily dependent on the nutritional intake, might also be indicators of social status whenever social stratification involves differential access to specific types of food, and if their concentration in bone is not affected by post-depositional factors. In this regard, Sr and Zn seem to be poorly affected by diagenetic processes (Lambert et al. 1985, Tate and Brown 1985) and the site corrected index of Sr to Ca (Observed Ratio, O.R.) (Schöning 1982, Navari et al. 1982) and the index of Zn to Ca (Fornaciari et al. 1984, Fornaciari and Mallegni 1987) may be good indicators of the importance of vegetable and meat consumption. For intragroupal comparisons the corrected O.R. index gives the same relevant information as the not corrected Sr/Ca index.

The purpose of the present paper is to correlate Sr and Zn content in bone with archaeological information regarding social status in two christian sites from Spain. The distribution of the burials around
RESULTS

Since all the samples analyzed belonged to adult individuals (both excluding subadult and old individuals) no age variability was expected. The range of variability of the results for both sites (Tables 1 and 2) was considerably high. No sex differences were found.

Individual results of Zn/Ca and O.R. indexes of the sample from Ceuta are shown in Table 1. The mean Zn/Ca index shows medium values, indicating a moderate intake of animal proteins in the diet. The mean O.R. index was extremely high, which might be due to a high consumption of marine foods, since they result in an increase of Sr bone content when diet is heavily dependent on them (Schnitzer and Peebles 1981, Sillen and Kavanagh 1982). Results of Zn/Ca and O.R. indexes of L’Esquerra are shown in Table 2. The mean values observed correspond to a pastoral economy, according to the classification suggested by Fornaciari and Mallegni (1987), with a high consumption of animal-derived proteins and low intake of vegetable foods. The spatial distribution of the Zn/Ca values obtained in the Paleochristian Basilica of Ceuta is shown in Figure 1 (simplified from Bernal 1989). Figure 2 (simplified from Ollich 1982) shows the Zn/Ca values distribution in L’Esquerra.

DISCUSSION

Two possible explanations can be hypothesized for the distribution of the burials within the Basilica of Ceuta. One could be related to the existence of an intentional planning of the total available area, and the other would consider random burial distribution.

![Figure 1: Spatial distribution of Zn/Ca index in the site of Ceuta.](image1)

![Figure 2: Spatial distribution of Zn/Ca index in the site of L’Esquerra.](image2)

The latter seems false at least for one individual (B-1), which is buried in front of the apse, in a privileged place called martyria. An important person of the community, usually a martyr, was usually buried in this place. When representing the Zn/Ca index values for each individual on their own burial place, a distribution pattern can be observed. Higher values are grouped near the apse of the building, and also in the central area, where the larger opus alpinum tombs are located. The individual at the martyria, which was considered the richest place of the Basilica, displays the highest value of Zn/Ca. This individual was an 18-year-old female. Medium values are located close to the lateral walls and the entrance area of the Basilica. The lowest indexes are located in the exterior of the precinct, near the north wall. Outside the apse walls, no burials have been discovered.

The distance from each individual to the most important point of the cult, the martyria, shows a high correlation with the Zn/Ca index (r = 0.7395, p < 0.01). Since the different burial types display variable Zn/Ca index values, it can be hypothesized that the observed differences are not related to different occupation time periods of the site.

The O.R. values do not show any clear distribution pattern, probably because marine diet can bring noticeable quantity of Strontium to it (Sillen and Kavanagh 1982). Ceuta was a fishing factory during the Roman period. Remains of a fish factory have been recently discovered near the Basilica. Ceuta is a highly favourable place for capturing large pelagic
fish, especially *Thunnus thynnus*, *Auxis rochei* and *Scomber scombrus*, because the Gibraltar Strait tends to concentrate pelagic migratory fish during their movements from the Atlantic Ocean to the Mediterranean Sea. Some fish vertebrae, and large amounts of shell (especially *Ostrea, Spondylus* and *Patella*) have been discovered in archaeological sites of Cuta.

The site of L’Esquerra is placed in a cold dry area, with low agricultural productivity. The proximity of the Montseny mountains stops the marine humid winds, causing the formation of fog that favours the development of grass and humid forests. Pastoralism was probably the predominant activity during the Middle Ages in this area. The bidimensional distribution of Zn/Ca index in L’Esquerra, shows a trend towards higher index values near the church, and near the line of the crack of the terrain. The distribution pattern is less clear in this case, probably due to differences in the temporal dimension. Pit grave burials, which are in the lowest stratigraphic level, show lower Zn/Ca values than the others. The variation coefficient of the O.R. index in this period (IXth to Xth centuries) is lower than in the following ones (Xith to XIVth centuries), which corresponds to the existence of a homogeneous, highly cohesive group of people in war land. According to Schöniger (1979), a variation coefficient larger than 20% for the Sr/Ca and Zn/Ca indexes can be considered as a sign of a heterogeneous sample, with different dietary patterns. Periods of economic growing are related to an increment of social diversification. The latest time periods in L’Esquerra have higher variation coefficients, coinciding with the development of the agriculture practice in the area. In any case, the concentration of high indexes near the fissure of the rock layer, can be related to the presence in that area of the best places to excavate anthropomorph deposits.

From the results shown, it can be concluded that social stratification inferred from an archaeological context may correlate with other anthropological evidence, such as bone trace element content as indicator of diet. Ecological, historical, archaeological and anthropological information is needed, though, when studying social organization of individuals from a site. Diagenetic processes may have altered the bone mineral content in bone if the location of the burial within the site might have been determinant for the preservation of the bone. Nevertheless, since samples were obtained from well-preserved bones, the observed archaeological correlate with Zn content suggests more likely that differences in dietary habits among individuals could have caused the spatial distribution of Zn content in bone.

**ACKNOWLEDGMENTS**

Trace elements analysis was performed at the Spectroscopy Service of the University of Barcelona. This research was partially financed by a grant of the "Instituto de Estudios Ceuties".

**REFERENCES**


Alejandro Pérez-Pérez
Secr. Antropologia
Dpto. Biología Animal
Fac. Biología
Universidad de Barcelona
Avda. Diagonal 645
08028 Barcelona, Spain