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## The Work Done in Rome by Children and Adolescents: Hypothesis Based on the Anthropological Analysis of Three Suburban Necropolises of the Imperial Age

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### ABSTRACT

#### The Work Done in Rome

We analyzed 95 non-adult individuals from three Imperial Roman burial grounds to explore the child labour in ancient Rome. The necropolis' analysed are Casal Bertone, Castel Malnome, and Lucrezia Romana, characterised by three different subsistence economy patterns. Considering the total sample, 69.5% of individuals have enthesopathies attributable to work commitments of medium severity. Specifically, individuals from Casal Bertone and Castel Malnome were the most affected in the scapular girdle, which is consistent with the activities carried out in the Fullery (*fullonica*) and the salt plains, respectively. Conversely, the enthesopathic alterations in Lucrezia Roman seem to be attributable to agricultural works.

**Keywords:** Skeleton - Children - Casal Bertone - Enthesopathies - Castel Malnome - Imperial Age

## Introduction

The ancient sources on the phenomenon of the work done by children and adolescents in the Roman world are very scarce<sup>1</sup>. Also, the archaeological documentation collected during the numerous excavations of burial grounds of the imperial age carried out in Rome - mainly following the intense preventive archeology activity conducted by the Special Superintendence of Archeology, Fine Arts and Landscape of Rome between the last years of the last century and the first fifteen of the current - rarely provides useful information in this regard. To overcome these limitations, anthropological research was undertaken, which using the data collected from both in the field and during subsequent laboratory investigations, could provide explanations on such an interesting aspect of daily life in Rome during the Imperial age.

## Materials and methods

Herein this presented work, 95 individuals of sub-adult age were examined, coming from three Roman burial grounds from the Imperial age era (I-III century AD), which came to light during the preventive archeology investigations conducted by the Special Superintendence of Archeology of Fine Arts and Landscape of Rome in the suburbs of the city (Fig. 1). In particular: 38 individuals were recovered in the funerary complex excavated in the Casal Bertone<sup>2</sup> district, about 1.5 km from the Aurelian Walls, between via Tiburtina to the north and via Prenestina to the south, near an extensive production plant relevant to a *fullonica*; 33 individuals in the funerary complex of Via Lucrezia Romana<sup>3</sup>, in the south-eastern area of the city, along the current Via Tuscolana and the route of the ancient Via Latina, in the immediate vicinity of the Villa dei Settebassi monument, to whose agricultural application it would refer, and 24 individuals in the necropolis of Castel Malnome<sup>4</sup>, in the South-West area, near Via Portuense, just before Ostia Antica, in an area adjacent to a Roman salt plains<sup>5</sup>.

The choice fell on these burial grounds mainly for three reasons: the numerical significance of the totality of the skeletal samples recovered (Casal Bertone N Individuals = 324; Lucrezia Romana N = 412; Castel Malnome N = 297)<sup>6</sup>, from which the criteria selected was that of sub-adult; the different types of subsistence and environmental economies hypothesised for the reference sites; the generally good state of conservation of the finds, rather infrequent in the infantile skeletons of contemporary Roman necropolises<sup>7</sup>. The diagnosis of age at death was mainly based on the degree of development of the teeth<sup>8</sup>, on the size of the diaphysis of the long bones and on the welding of the epiphysis with the diaphysis<sup>9</sup>. As regards the determination of sex, with an awareness of the impossibility of determining the sex of infants I and II based on morphological criteria<sup>10</sup>, an attempt has been made to diagnose individuals over the age of 16, when changes due to puberty should have allowed the development of secondary sexual characteristics on the skeleton.

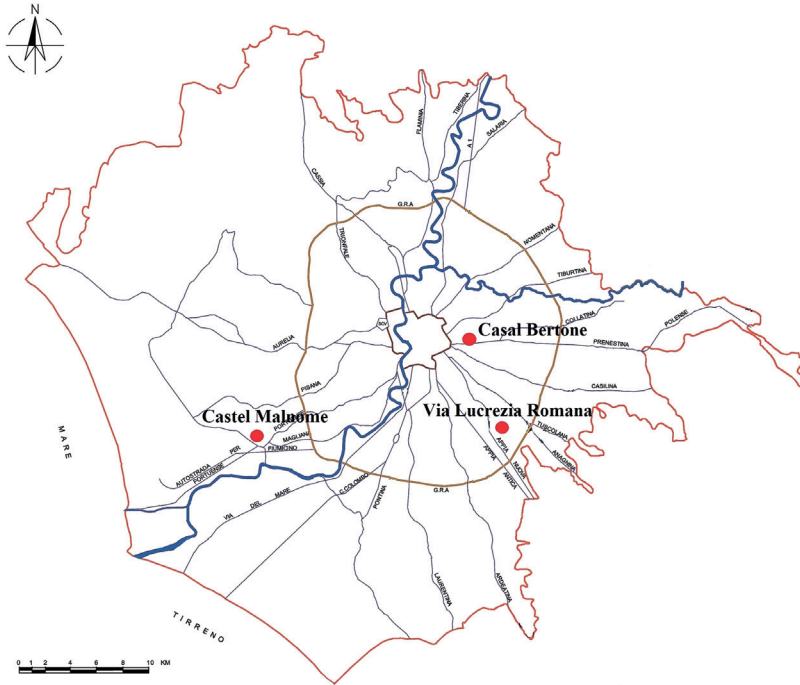


Fig. 1. Pianta di Roma con le necropoli prese in esame

The duration of laboratory investigations carried out on the infantile II (7 - 13 years) and juvenile (14 - 19)<sup>11</sup> components of the samples identified a frequency of pathological changes resulting from intense physical and work activity was noted (MOS: markers of occupational stress)<sup>12</sup>, despite the difficulties of interpretation<sup>13</sup>, it was decided to subject these sub-samples to a systematic investigation, following the standardised detection method proposed by Valentina Mariotti<sup>14,15</sup>. Enthesis are the insertion areas of tendons and ligaments: if subjected to stress, they can show bone proliferation and/or erosion. These alterations are consequent to a non-specific pathological state, defined as enthesopathy. Enthesopathies are divided into: osteophytic proliferative forms (OF) and osteolytic erosive forms (OL) and are classified according to three degrees of expression that define the pathological levels: the first corresponds to slight porosity and exostosis of less than one millimeter (OL1; OF1); the second to numerous areas of erosion and exostosis ranging from one to four millimeters (OL2; OL2); the third with alterations greater than four millimeters (OL3; OF3). (Fig. 2) shows the entheses detected in the course of this work.

Entesi	Movimento
Deltoido (clavicola)	Abduzione del braccio
Legamento costo-clavicolare (clavicola)	Tutti i movimenti della spalla
Legamento trapezoide	Tutti i movimenti articolazione scapolo-clavicolare

Entesi	Movimento
Gran pettorale (omero)	Adduzione e rotazione interna del braccio
Gran dorsale e gran rotondo (omero)	Adduzione, estensione e rotazione interna del braccio
Bicipite brachiale (radio)	Flessione dell'avambraccio sul braccio e del braccio sulla spalla
Pronatore rotondo (radio)	Pronazione e flessione dell'avambraccio
Brachiale (ulna)	Flessione dell'avambraccio sul braccio
Grande gluteo (femore)	Estensione e rotazione esterna del femore
Soleo (tibia)	Estensione del piede

Fig. 2. Entesi di muscoli e legamenti rilevati nel presente lavoro

## Results

In the totality of the examined samples, an individual frequency of enthesopathies equal to 69.5% was found. 24.2% of individuals with enthesopathies died between 7 and 13 years, 75.8% between 14 and 19 years. Observing the distribution of the phenomenon in the three necropolises, it is noted that the frequency of enthesopathic individuals in Casal Bertone is 81.6% (among these 32.3% fall into the 7-13 year old age group, 67.7 % in class 14-19); in Castel Malnome it is 50% (of these 25% died in the 7-13 class, 75% in the 14-19 class); in Lucrezia Romana it is 69.7% (among these 13% are in the 7-13 class, 87% in the 14-19 class). The average value of the individual frequencies of enthesopathies in the upper limbs is 60%, in the lower limbs is 35.8%; in Casal Bertone it is respectively 76.3% and 55.3%; in Castel Malnome by 41.7% and 25%; to Lucrezia Romana by 54.5% and 18.2%.

The whole of the data sets indicates a greater effort exerted by the upper region of the body compared to the lower in all three necropolises; moreover, the difference between the values of Casal Bertone and those of Castel Malnome may be due to the different types of activities hypothesised for the two communities of reference: in fact, while the participation of children and adolescents in the work of the *fullonica* is also proven by the Pompeian frescoes of the *Fullonica* by *Lucius Veranius Hypsaesus*, preserved at the National Archaeological Museum of Naples, a small number of sub-adults seem to be involved in the activity carried out in the salt plains, since it is too onerous a job, unsustainable for their still developing physique. For Lucrezia Romana, the data seem compatible with the hypothesis of a commitment to agricultural work.

A detailed examination of the alterations of the single insertions, of how they are distributed on the skeletal segments, and of the different degrees of expression that define their severity allowed, as explained below, to confirm these hypotheses.

Observing Figs. 3, 4 and 5, it is immediately evident that the bone of the upper limbs most stressed is the clavicle, in particular, at the point of insertion of the costo-clavicular ligament: this joins the costal tuberosity of the clavicle to the upper margin

clavicola	%	omero	%	radio	%	ulna	%
costo-clavicolare	44,7%	gran pettorale	28,9%	bicipite brachiale	5,3%	brachiale	2,6%
deltoide	44,7%	g. dorsale g. rotondo	18,4%	pronatore rotondo	18,4%		
trapezoide	7,9%						

Fig. 3. Incidenza delle entesopatie sugli arti superiori a Casal Bertone

clavicola	%	omero	%	radio	%	ulna	%
costo-clavicolare	29,2%	gran pettorale	12,5%	bicipite brachiale	8,3%	brachiale	4,2%
deltoide	25,0%	g. dorsale g. rotondo	8,3%	pronatore rotondo	---		
trapezoide	8,3%						

Fig. 4. Incidenza delle entesopatie sugli arti superiori a Castel Malnome

clavicola	%	omero	%	radio	%	ulna	%
costo-clavicolare	45,4%	gran pettorale	15,1%	bicipite brachiale	---	brachiale	3,0%
deltoide	9,1%	g. dorsale g. rotondo	12,1%	pronatore rotondo	3,0%		
trapezoide	3,0%						

Fig. 5. Incidenza delle entesopatie sugli arti superiori a Lucrezia Romana

of the first costal cartilage and is involved in all shoulder movements (Fig. 6). The highest individual frequencies are noted in Lucrezia Romana (45.4%) and Casal Bertone (44.7%, even higher than that found in the adult fraction of the sample which is 38.5%)<sup>16</sup>, while in Castel Malnome the value is 29.2%, much lower than that of adults (55.3%). Cost-clavicular enthesopathies are all present in osteolytic erosive form (OL): in Casal Bertone (OL1 = 40%; OL2 = 44%; OL3 = 16%) and in Lucrezia Romana (OL1 = 29.2%; OL2 = 54.2%; OL3 = 16.6%) the alterations of major pathological level (OL2 + OL3) are more frequent than the less severe ones (OL1), while in Castel Malnome (OL1 = 63.6%; OL2 = 36, 4%; OL3 = 0) the situation is reversed. Regarding the insertion on the collarbone of the deltoid, the shoulder muscle that determines the abduction movement of the arm, it is noted that the individual frequency is much higher in Casal Bertone (44.7%) than in Castel Malnome (25%) and even more than that of Lucrezia Romana (9.1%). The enthesopathies of the deltoid occur in the three necropolises both in an osteolytic erosive form (OL) and - to a greater extent - in an osteophytic proliferative form (OF) and generally define a level of the pathology that is not serious. The trapezoid ligament constitutes the anterior bundle of the coraco-clavicular ligament, which unites the coracoid process of the scapula to

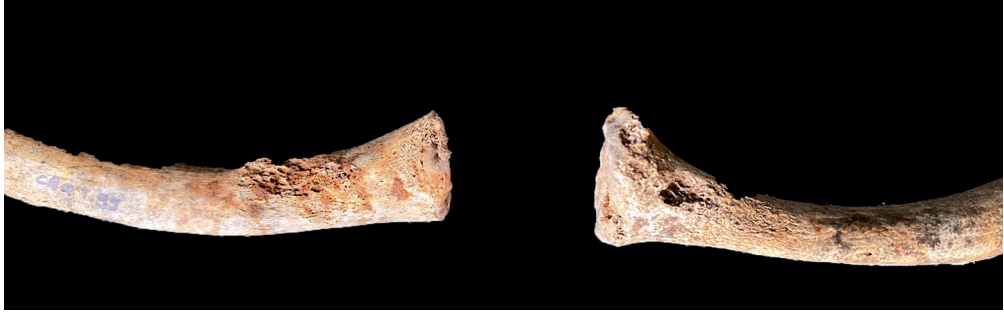


Fig. 6. Entesopatia del legamento costo-clavicolare nell'individuo della tomba 99 (9-11 anni) di Casal Bertone

the clavicle, participating in all movements of the joint: in all three necropolises the frequency of its enthesopathy is low and is always identified as OF1.

The most stressed insertion on the humerus is that of the pectoralis major muscle, primary functions are flexion, adduction, and internal rotation of the humerus inside the arm. The individual frequency is 28.9% in Casal Bertone, 12.5% in Castel Malnome and 15.1% in Lucrezia Romana. The alterations are all that of the osteolytic erosive type, except in two cases in Casal Bertone, where they occur in an osteophytic proliferative form; they never reach the third level of severity, distributing themselves with similar frequencies between the first two. Lower, but not by much, the individual frequencies of the alterations of the insertions of the great dorsal and the great round, muscles that intervene in the movements of adduction, extension and internal rotation of the humerus; also in this case, the enthesopathies are mostly of the osteolytic type, of the first and second pathological level.

Only four individuals (two from Casal Bertone and two from Castel Malnome) show signs on the radius enthesopathies of the biceps brachial muscle, which acts on the flexion of the forearm on the arm and this on the shoulder. Enthesopathy of the Pronator teres muscle, which contributes to pronation and flexion movements of the forearm, is more frequent in Casal Bertone (18.4%), while it affects only one individual in Lucrezia Romana and none in Castel Malnome.

Enthesopathy of the brachialis, the most powerful flexor muscle of the forearm, was found on the ulna, but only in three individuals, one for each necropolis. Both on the radius and on the ulna, the alterations are never of the third level of severity.

Regarding the lower limbs (Fig. 7, 8 and 9), gluteus maximus enthesopathy was detected on the femur, which extends and rotates the thigh outward, was present only in Casal Bertone individuals (18.4%), mostly in osteolytic erosive form, never third degree. Enthesopathy of the soleus (Fig. 10) (which contributes to foot extension and leg flexion) is present on the tibia in all three necropolises, but with different frequencies: in Casal Bertone it is very widespread (47.4%), sometimes even in severe form; less so in Castel Malnome (12.5%) and in Lucrezia Romana (15.1%) and never in severe form.

femore	%	tibia	%
grande gluteo	18,4%	soleo	47,4%

Fig. 7. Incidenza delle entesopatie sugli arti inferiori a Casal Bertone

femore	%	tibia	%
grande gluteo	---	soleo	12,5%

Fig. 8. Incidenza delle entesopatie sugli arti inferiori a Castel Malnome

femore	%	tibia	%
grande gluteo	---	soleo	15,1%

Fig. 9. Incidenza delle entesopatie sugli arti inferiori a Lucrezia Romana



Fig. 10. Entesopatia del soleo nell'individuo della tomba 60 (16-17 anni) di Lucrezia Romana

Having availability to the anthropological data of the field, the number of individuals with funeral equipment (28.4% of the entire sample) and those who were without them was related to the number of individuals with enthesopathic lesions: even if the results are to be considered purely indicative, since Roman burials of the Imperial



age, the grave goods can rarely be indicative of belonging to higher social classes, generally including objects of common use and not of merit<sup>17</sup>, it is interesting to note that only 27.3% of individuals with enthesopathies have accompanying goods, while 72.7% do not have them. These values are very similar to those obtained by examining the three necropolises individually.

It was possible to determine the sex of 17 individuals: among the eight males, six had enthesopathies, while among the nine females, only three showed them. The sample is too small to allow us to hypothesize a differentiation between the two sexes with respect to work activities, but it is hoped that the molecular diagnosis of sex, of which the best preserved individuals are currently undergoing tests at the Laboratory of the Molecular Anthropology Center for study of ancient DNA, at the University of Rome Tor Vergata, can provide useful data for this purpose as soon as possible.

## Conclusions

During the excavation of the three necropolises examined, it was not possible to recover any useful element to insert with certainty the individuals analyzed among the slaves, the freedmen or the free, but it is important to underline that child labour in Rome during the Imperial age could interest everyone. The social levels<sup>18</sup>, excluding only the wealthy and aristocrats, never directly involved in the transformation processes of the materials. However, the excavation documentation and laboratory analysis in our possession do not allow us to place the sub-adults examined among the privileged. In any case, it was the servile state that condemned the children to carry out some form of, more or less, physically demanding work at an early age. Our data indicate that overall, 69.5% of individuals have enthesopathies and of these 75.8% died in youth, 24.2% in childhood II.

In Casal Bertone, where children with alterations are 32.3%, the most affected bone of the upper limbs and shoulder girdle is the clavicle, in particular at the level of insertion of the costo-clavicular ligament (44.7%) , whose development is connected to the lifting of weights above the head<sup>19</sup> and to the continuous movements of extension and flexion of the arms - similarly to what Luigi Capasso found in the boy E33 of Herculaneum<sup>20</sup> - due in our case to the treatment of the tissues inside the basins and their subsequent spreading for drying. Injuries to the insertion of the deltoid muscle are also widespread (44.7%), probably following the effort exerted by the shoulders in pivoting with the arms moving and lifting the basins into position on the wall shelves.

Quite high frequencies were also detected at the insertion on the humerus of the pectoralis major (28.9%), of the great dorsal and great teres (18.4%) and on the radius of the pronator teres (18.4%): these too alterations can be related to the type of work done within the *fullonica*. In the lower limbs, enthesopathy at the origin of the soleus on the tibia is particularly widespread (47.4%), even greater than that found in adults



(37.9%)<sup>21</sup>, due to a continuous plantar hyperflexion, which is a supposed exercise during the pressing of the fabrics with the feet inside the basins.

In Castel Malnome the most stressed bone is the clavicle, at the point of insertion of the costo-clavicular ligament (29.2%) and the deltoid muscle (25%): these frequencies, however, are decidedly lower than those found in the adult portion of the sample. (Respectively 55.3% and 60.8%)<sup>22</sup>, confirming the hypothesis of a reduced involvement of children and adolescents in the heavy work of lifting the bags of salt. This hypothesis is reinforced by the observation of the lower limbs, where the most frequent enthesopathy is at the origin of the soleus (12.5%), indicating a strenuous walking on uneven ground, but the value is significantly lower than that of adults. (51.6%).

For Lucrezia Romana, no comparisons with the adult fraction of the sample are available at present, but our data indicates the involvement, in particular, that of adolescents, in the manual work carried out in the fields<sup>23</sup>, as supposed on the basis of archaeological evidence. In fact, the following were found: a high frequency of enthesopathies of the costo-clavicular ligament (45.4%), a probable effect of hoeing works; alterations on the humerus at the insertion of the pectoral grandis (15.1%) and the grand dorsal and grand rotunda (12.1%), due to the effort made by pulling weeds; injuries on the shins upon insertion of the soleus (15.1%), a consequence of walking on steep terrain. It is hoped that the continuation of the research will provide further useful elements to clarify such an interesting and little-known aspect of the social history of ancient Rome.

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