

## DNA REVEALS THE SECRETS OF THE ANCIENT MASTERS

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In order to realize their artworks, artists owned a variety of natural materials selected through centuries on the basis of technological and aesthetic criteria. In particular binding media, which function was exactly “to tie” pigments to the surface to decorate, had to be adhesive and transparent as well as glues used to prepare the support before painting. Thanks to their experience, craftsmen and artists usually selected materials locally available but, if needed, also between those imported from far regions. Acquiring thorough information about materials used in realizing an artwork could not only supply precious elements for determining its authenticity but also reveal important historical, economic, social and cultural aspects. The characterization of binding media is currently carried out on tiny micro-samples taken from the cultural heritage object and analyzed by vibrational spectroscopy and gas-chromatographic methods. Micro-FTIR analysis informs on the chemical composition of the binder, allowing for a first discrimination between protein, glycosides and lipids, while GC-MS gives insight on their specific typology but does not allow to identify their biological origin. In this regard, we moved toward the exploitation of the high specificity and high sensitivity offered by the state-of-the art DNA analysis, focusing our efforts in the development of a suitable protocol for the identification of the biological origin of binding media on tiny samples from ancient paintings. In particular, our aim was that of molecularly characterize mitochondrial regions of the species traditionally employed for obtaining animal glues and siccativ oils. The model has been developed working on aged painting models and then tested to analyze samples from the preparation layers of the *Madonna di Citerna* realized by Donatello (1415-1420) where, by GC-MS and FTIR animal glue was identified. The results we obtained are amazing in terms of both sensibility and specificity of the method. First of all it was possible to confirm that Donatello used animal glues for realizing his Madonna and, specifically, those derived from *Bos taurus*. Data obtained from sequencing confirm that each samples present more than one glue and that the vast majority of these fall into two common European taurine lineages called T2 and T3. There is one remarkable exception represented by one sample which could not be ascribed to any of the T subclades. Based on its polymorphisms, it falls into the same radiation of R, a surviving lineage of the now extinct European aurochs.