
ANTHROPOMORPHIC WOODEN RELIQUARIES AN INTEGRATED APPROACH TO RESTORATION

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(Received 23 October 2014, revised 13 January 2015)

Abstract

Two wood anthropomorphic reliquaries, belonging to Lipsanoteca of Epiphany Church, Trapani (Italy), were restored following procedures based on an interdisciplinary approach. The historic-artistic contextualization, constitutive materials and executive techniques were defined. Degradation events were correlated to physical-chemical factors, with particular attention to biodeteriogens. Insect infestation was revealed, by optical (OM) and scanning electron microscopy (SEM) of *rosume* and insect body remains, *Anobiumpunctatum* was identified. Microbial colonization was revealed and characterized by an integrated approach based on OM (Lugol's staining), *in vitro* culture and molecular investigation (microbial DNA extraction, PCR *in vitro* amplification, DNA sequences analysis). Cleaning and integrations *ad hoc* performed on both Saint Devorino and Saint Cosmo reliquaries have brought the artworks to their cultural extraordinary value putting in evidence their peculiarities. Finally the relics of Saint Devorino (human bone) and Saint Cosmo (teeth) were analysed through visual investigation, finding them in a good state of preservation.

Keywords: lipsoteca, saints, relics, biodeterioration, conservative restoration

1. Introduction

Religious expression is usually associated with a variety of structures (churches, monuments) bedecked of artefacts (sculptures, paintings, frescoes, etc.) including reliquaries. The reliquary is a theca made with different shapes and constitutive materials, usually precious, designed to preserve and exhibit relics. This may be the purported physical remains of saints, such as bones, clothing fragments or some object associated with saint. Initially, reliquaries were monumental altars that were built over tombs or remains of martyrs, saints,

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Apostles or other religious figures. During the first millennium, the cult of saints and relics determined the shape and structure of reliquaries assembled using gold, silver, wood, stone, reaching remarkable values and preciousness. Braun [1] classified these “containers for relics” into categories and subcategories, as well as reported by Montevicchi and Vasco Rocca in the *Thesaurus Terminology of Ecclesiastical furnishings* (Central Institute for Cataloguing of the Ministry for Cultural and Environmental Heritage) [2]. A particular kind of reliquary originated in the ninth century, mainly reproducing part of human body, were classified as anthropomorphic. In Romanesque and Gothic periods anthropomorphic reliquaries were the most common typology [3]. These artefacts mainly suffer from un-controlled climate conditions and from their regular use or misuse.

In this study two wood reliquaries, dedicated to Saint Devorino and Saint Cosmo, have been restored following an interdisciplinary approach based on art-history study, identification of wood species and their changes over the time, evaluating the chemical-physical factors and biological factors, able to induce the deterioration of these materials. Particularly for microbial deteriorogens (bacteria, fungi) identification, molecular biology techniques have been applied following the papers of comprehensive and ongoing research results, as well as specific case studies for microbial identification reported in the *Molecular Biology and Cultural Heritage* International conference book [4]. Furthermore the characterization of executive technique, author and related school, and the analysis of Saint Devorino and Saint Cosmo reliquaries (a bone fragment and a tooth, respectively) completed the knowledge on these peculiar artworks.

2. Experimental

2.1. Microbial identification

Biological deterioration of reliquaries induced by bacteria and fungi was investigated by different technological protocols based on microscopy, *in vitro* culture and molecular biology techniques. Samples were collected from reliquaries surface by sterile swab or Nylon membranes (Amersham H+), fragments that were used to inoculate Nutrient Agar plates, incubated at 30°C for 24-36 hours (Figure 1). Microbial colonies were characterized by *in vitro* amplification (PCR) of rDNA molecular marker and sequence comparison [5-9].

2.2. Wood identification and insect infestation

Thin sections of wooden fragments, collected near the holes or the cracks in hidden points of reliquaries structure, were analysed and two woods species, Lime (*Tilia* L.) and Poplar (*Populus* L.), have been identified for the anthropomorphic structures and for the support bases respectively [10].

Both reliquaries suffered a deep xylophages insect attack, Figure 2, identified as *Anobiumpunctatum* De Geer by insect rests and *rosume* analyses, through Wild optical microscope (40X) and Scanning Electron Microscope, Leica – LEO 420 [11].

Reliquaries were disinfested keeping in a clean room (heat-sealed polyethylene *ad hoc* assembled) for 20 days and by Permethrin treatment [12].

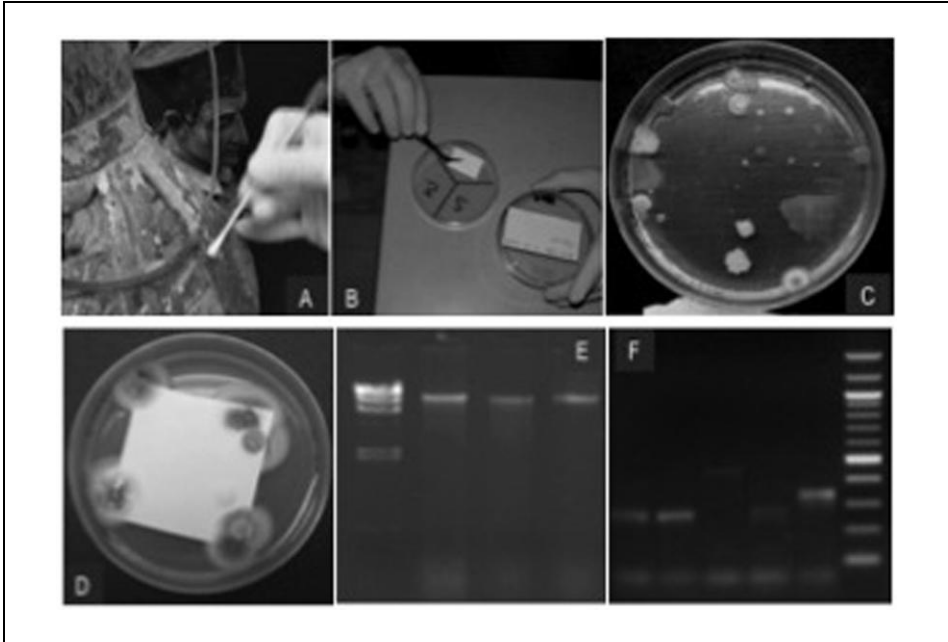


Figure 1. Microbial identification: sampling by (A) sterile swab and (B) Nylon Membrane fragment, utilized to inoculate Nutrient agar plate. Isolated (C) bacterial and (D) fungi colonies, characterized by molecular biology techniques based on (E) microbial DNA extraction and (F) *in vitro* amplification of DNA target sequence.

2.3. Wood consolidation

The acrylic resin Paraloid B 72, diluted in acetone (percentages ranging from 2 to 7%, in order to obtain a gradual penetration), was injected with a syringe through the worm-eaten points revealed onto wood surfaces [13].

2.4. Cleaning steps

After dusting, the first lipophilic layer was removed by Ligroin (free-form Petroleum ether), by cotton swabs (Figure 3). This solvent (non-polar and volatile) allowed the removal of the lipophilic coat without interacting at all with the underlying layers. The cleaning of the flesh tint, was performed by a mixture of organic solvents (Ligroin–Acetone LA7-fd 62), prepared referring to Wolbers test. Gildings have been cleaned by Ligroin–Tween 20 mixture, while decorated

surfaces by a mixture Ligroin–Acetone (LA5-fd 72) or by Acetone-Ethanol solution.

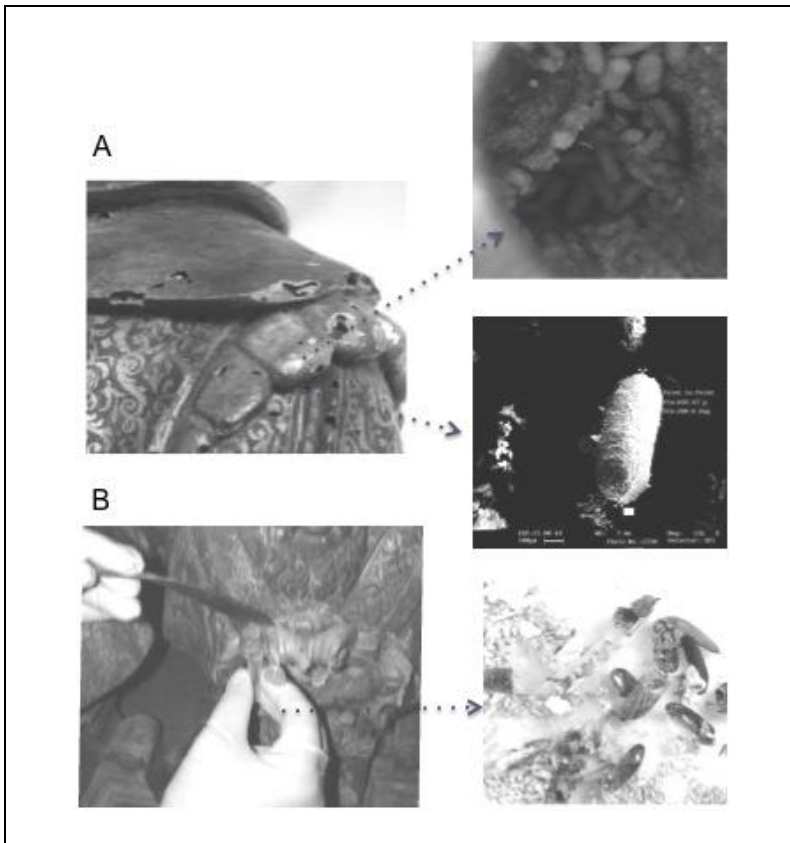


Figure 2. Reliquaries infestation by *Anobium punctatum* revealed in: (A) Saint Cosmo by optical microscope (up) and SEM (middle) and (B) Saint Devorino insect remains (down).



Figure 3. Cleaning test performed on: (a) Saint Cosmo and (b) Saint Devorino reliquaries.

The mixtures were gelled by adding 2% hydroxy-propylcellulose (Klucel gel), applied for few minutes and subsequently removed by Ligroin wetted swabs [14, 15].



Figure 4. Conservative restoration intervention: Saint Cosmo - (a) before and (b) after, Saint Devorino - (c) before and (d) after.

2.5. Recreate the paint film harmony

The flesh weaknesses reintegration was performed by *Selezione cromatica* technique, using varnish colours and dashed vertical line, in order to connect colour of the gaps with the chromatic characteristics of surrounding area. The

surface reintegration was chromatically reconstructed by *Puntinato* technique [16].

3. Conclusions

Investigations performed during the different phases of reliquaries restoration shed light on constitutive materials, pigments and binders, gilding layers, defining the state of conservation of wooden artefacts. Before restoration, the reliquaries showed several degradation events as recognizable in Figure 4a (Saint Cosmo) and Figure 4b (Saint Devorino).

Onto the entire surface of both reliquaries a homogeneous layer was revealed, as well as a general discoloration of the surface due to yellowing of coarse paint, applied probably in previous maintenance. A specific cleaning protocol was applied, considering the characteristics of painting layers, by using Ligroin, or Ligroin-Acetone mixtures.

Paraloid B72 (diluted in acetone, from 2% to 7%) was injected in the flicker insect holes; the gradient of concentration was needed to obtain a gradual penetration of the consolidating product [13].

Adhesion between the wood preparatory layers and paint film was strengthened by injecting small amounts of rabbit glue via syringe, applying gentle pressure with a thermo-cautery interposing a sheet of Japanese paper. The painting reintegration, guarantee the recovery the correct reading of the manufacts adapting perfectly to their three-dimensional shape.



Figure 5. *Estofado* technique - perfection in carving, richness in painting.

This restoration pointed out the great skill on carvings and the richness of the paintings that the Neapolitan school performed for the production of busts and, as shown in Figure 5, for both Saint Devorino (bishop and martyr) and Saint Cosmo reliquaries. The clever use of various methods for working with

gold leaf [17], *meccatura* pigment (red lacquer) and the *estofado* technique [18] have made busts reliquaries as high historic-artistic value artworks.

Finally, as reliquaries are exposed in confined environments, these should be constantly monitored for both thermo-hygrometric values and microbial colonization, in order to perform a correct fruition, avoiding hazards for both works of art (biodegradation) and operators/visitors (human health) [19-21].

The bones of martyrs were believed to provide evidence of the power of work of God in the world, producing miracles and spectacles of the effectiveness of faith. The cults of saints and relics were an important part of religion during late antiquity and the Middle Ages, and even today relics, the remains of the holy dead, were thought to have miraculous powers. An indirect cult form involves the veneration of objects that stand in a magical relationship with the respective saint. In this connection there can be a veneration of the saint's relics; such religious practices are to be understood in terms of spiritual power. We hypothesize that the remarkable exchanges of knowledge from scientists to conservators/restorators and art historians, for sure improved strategies for the conservation and sustainable fruition of cultural heritage [22].

Acknowledgment

The authors thank the Soprintendenza BB. CC. AA. - U.O.X and the Museo Regionale Interdisciplinare Pepoli, Trapani. Also thank S. Torre, G. Mancuso, R. Sorrentino for human relics analysis, G. Liotta and B. Megna, Università degli Studi di Palermo, for insect and wood characterization respectively.

References

- [1] J. Braun, *Die Reliquarie des christlichen Kult und ihre Entiwicklung*, Herder & CO. GMBH. Verlagsbuchlungshandlung, Freiburg/i.Br, 1940.
- [2] B. Montevecchi and S. Vasco Rocca, *Suppellettile Ecclesiastica*, vol. 1, Biblioteca Accademia della Crusca, Firenze, 1988.
- [3] M.C. Di Natale, *Opere d'Arte nelle Chiese Francescane. Conservazione, restauro e musealizzazione*, Plumelia edizioni, Palermo, 2013, 9.
- [4] J.M. Gonzalez, *Overview on existing molecular techniques with potential interest in cultural heritage*, Proc. of International Congress 'Molecular Biology and Cultural Heritage', C. Saiz-Jimenez (ed.), Balkema Publishers, Lisse/Tokyo, 2003, 3-14.
- [5] F. Palla, *Journal of Conservation Science in Cultural Heritage*, **4** (2004) 183.
- [6] F. Palla, N. Billeci, F.P. Mancuso, L. Pellegrino and L.C. Lorusso, *Journal of Conservation Science in Cultural Heritage*, **10** (2010) 185.
- [7] F. Palla, *Journal of Entomological and Acarological Research*, **43** (2011) 61.
- [8] F. Palla and E. Tartamella, *Journal of Conservation Science in Cultural Heritage*, **7** (2007) 111.
- [9] F. Palla, *Analysis of microbial colonization. Analytical methods*, Science and Conservation in Museum Collection, Nardini Editore, Firenze, 2012, 459.

- [10] R. Nardi Berti, *La struttura anatomica del legno e il riconoscimento dei legnami italiani di più corrente impiego*, 2nd edn., S. Berti, M. Fioravanti & N. Macchioni (eds.), IVALSA, Firenze, 2006, 1-4.
- [11] E. Chiappini, G. Liotta, M.C. Reguzzi and A. Battistini, *Insetti e Restauro*, Edagricole, Bologna, 2001, 71-208.
- [12] M. Johnsen, *The Aerosol Handbook*, Wayne Dorland Co, New Jersey, 1982, 305-372.
- [13] A. Phenix, *Conservation News*, **48** (1992) 21.
- [14] C. Stravroudis, T. Doherty and R. Wolbers, *Western Association for Art Conservation Newsletter*, **27** (2005) 17.
- [15] G. Fife, J. Van Och, K. Seymour and R. Hoppenbrouwers, *Tissue gel composite cleaning at SRAL*, Preprints from International Conference ‘Cleaning 2010 – New insights into the cleaning of paintings’, L. Fuster-López (ed.), Universidad Politecnica de Valencia, Valencia, 2010.
- [16] C. Paolini and M. Faldi, *Glossario delle tecniche pittoriche e del restauro*, Palazzo Spinelli, Firenze, 1999, 211-212.
- [17] G. Pignolo, *Effetti d’oro-Storia e tecnica della doratura nell’arte*, Editrice Compositori, Bologna, 2000, 1-142.
- [18] I.C.A. Sandu, L.U. Afonso, E. Murta, M.E. DeSa, *International Journal of Conservation Science*, **1** (2010) 47-62.
- [19] C. Pasquarella, G. Pasquariello, C. Balocco, E. Saccani, E. Marmonti, F. Palla, M. Ugolotti, O. Maggi and R. Albertini, *Biological and microclimatic diagnosis in cultural heritage conservation: interdisciplinary research at Palatina library in Parma*, Proc. of 6th International Congress ‘Science and Technology for the Safeguard of Cultural Heritage in the Mediterranean Basin’, CNR – AIC, Athens, 2013, 186.
- [20] F. Palla, E. Di Carlo, G. Barresi, R. Chisesi, S. Barbaro and M. Sebastianelli, *Bioaerosol in indoor environments for conservation of cultural heritage: potential risks for historical-artistic manufactures and human health*, Proc. of 11th International Conference Indoor Air Quality in Heritage and Historic Environments, ASCR, Prague 2014, 47.
- [21] J. Peltola, M.A. Andersson, T. Haahtela, H. Mussalo-Rauhamaa, F.A. Rainey, M. Kroppenstedt, R.A. Samson and M.S. Salkinoja-Salonen, *Applied Environmental Microbiology*, **67** (2001) 3269.
- [22] M. Sebastianelli and F. Palla, *OADI – Osservatorio per le Arti Decorative in Italia*, **2** (2010) 95.