"Prevention beats cure": Simple and sustainable approaches in preventive conservation

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Abstract

Although the history of preventive conservation reaches back into the ancient world, its implementation continues to be in its infancy. Those who engage with it gain an effective and sustainable toolkit for the preservation of cultural heritage – economically, socially, ecologically; interference with the object is reduced to a minimum. Preventive conservation is all about caring for a collection. Although an understanding of materials, deterioration processes and environmental impacts is helpful, implementation is possible instantaneously and without much effort.

Important aspects of this interdisciplinary field are surveyed, touching on climate, cleaning and IPM, specifically the sustainable prevention of mould. The article presents what is of particular importance in that respect, shows that even small measures and "continuity" lead to success, and argues why the instruction and involvement of all co-workers is so important.

Keywords: preventive conservation, climate management, room hygiene, dust, mould, biomonitoring

In spite of its core notions going back to antiquity, a unifying definition has not yet been developed for preventive conservation (e.g. E.C.C.O 2002: 2, ICOM 2008). Essentially, it comprises of all indirect measures aimed at the preservation of culture heritage, i.e. it does not intrude into the substance of an object but merely manipulates its environment. Similar to the philosophy of health-related prevention it goes that "prevention is better than cure". Efforts aimed at curbing deterioration require an understanding of its causes. These include catastrophes / emergencies, such as (1) fire, (2) water and (3) theft. Moreover, they include cumulative damage of (4) a physical nature (dust, visitors, vibration, events, wrong cleaning), (5) a chemical nature (gaseous, fluid and solid pollutants, food) and (6) a biological nature (microorganisms, insects, birds, rodents), as well as (7) light, (8) relative humidity and (9) temperature.

Embracing responsibility for objects as well as for individuals, the environment and finances (Hammer 2009:3; Hammer 2010), preventive conservation is sustainable in itself. With many museums lacking personnel, time and money, affordable and uncomplicated methods gain in importance (Kipp 2016:ix). Best practice does not aim at meeting an inappropriately high standard but the best employment of the available resources towards improving the state of a collection

<k>*and*<k> preserving the environment (Martin 2006). Components of preventive conservation include (1) awareness training of co-workers into the necessity of preventive measures, (2) control of the indoor climate and (3) -hygiene, this being more important than usually perceived, and (4) integrated pest management (IPM).

(1) Awareness: Introductory training on preventive measures should be offered regularly (Hammer 2012: Kap. 3; Arndt et al. 2010: 6, 10). It should render an understanding that even small steps towards the protection of collections, health and the environment are preferable to costly repair and why such measures cannot wait. Cleaning, protection and emergency plans should be compiled and updated collectively (Hammer 2018: 73,87 and references).

(2) Climate

(2.1) Monitoring: Preventive conservation should aim at avoiding strong fluctuations of climate, temperatures above 21°C and a humidity above 60%. An essential first step involves acquiring good knowledge of the indoor climate; and for this purpose it is sufficient to use a standard hygrometer to record current values, with modern devices allowing 24h monitoring of short-term fluctuations (see devices: hygrometer). A datalogger is preferable for the purpose of longer-term, continuous monitoring (see devices: datalogger).

(2.2.) Humidity: If humidity exceeds a 55% threshold or exhibits fluctuations in excess of what is advisable for the object, a dehumidifier needs to be employed. For peaks in excess of 60% urgent action is required as there is an acute risk of mould infestation. The dehumidifier should switch on automatically when excessive humidity is recorded, it should be adequate for the room volume and energy-saving; the size of the basin should not be too small and/or drainable (see devices: dehumidifier). To avoid the spread of germs basin and filter should be emptied and cleaned regularly.

(2.3) Temperature: In summer, excessive indoor temperatures in collections are increasingly problematic. As an immediate measure doors and shutters should be kept shut and door curtains should be closed. Heat protective foil (see devices) mounted on windows deflects up to 80% of sun energy. Ventilation should be used to increase circulation. Caution is required in respect to mobile air conditioners, as they not only reduce the temperature but also regulate humidity to a level of 55%, optimal for humans but too high for many objects.

In winter, conventional heating may create a large gradient between room and wall temperature, where condensation may lead to the concentration of dust and spores on walls and cool surfaces and, thus, to mould growth. For this reason furniture and paintings should be placed with a distance of around 10 cm to the wall. A sustainable solution is the installation of wall heating (internal or panels) which curbs convection, homogenizes the room temperature and minimizes the risk of microclimates. The mounting of infrared panels at particularly critical spots, e.g. corners with cold spots / bridges is an alternative and less costly option. An even simpler measure is to avoid (over-)heating altogether. For avoiding the cold-wall problem the room temperature should not exceed a maximum of 5°C over and above the wall temperature. The latter is easy to measure with common digital surface fever thermometers (set to object/wall measurement). For the regulation of the room temperature, programmable thermostatic valves (see devices) can be mounted to radiators at relatively low cost.

(3) Hygiene: In contrast to Anglo-Saxon countries, room- and object hygiene is much underrated in central European countries. The English National Trust publishes the “Manual of housekeeping” (National Trust 2006), a comprehensive collection of guidance to cleaning and storage for all relevant objects dating back to the 17th century. The instruction video “Preparing to clean – Housekeeping for historic sites” (NMSC 2011) provides an impressive introduction to regular cleaning action.

Room- and object hygiene should be a top priority in respect to health and object protection and should not be considered a “necessary evil”. The dust burden in museum depots frequently exceeds by a factor of 2-4 the maximum quantity recommended by WHO (Skora et al. 2005: 399). Dust causes mechanic damage to objects and contains accumulated pesticides (Marcotte et al. 2014: 68, Spiegel et al. 2019). It is main medium for the transmission of mould and bacteria. Being hygroscopic, dust attracts humidity and thus fosters mould growth, and in particular so after water damage.

For these reasons, it is important to instruct all staff and, possibly visitors, about the importance of regular cleaning and involve them in devising cleaning routines. Different parts of the museum can be grouped easily into risk zones and assigned cleaning priorities (Pinniger 2011: 17).

Vacuum cleaners play an important role (NMSC 2011). Class H safety cleaners (specification HEPA H-14, DIN EN 60446-2-69 and passage <0,005%, see devices: cleaners) are advisable for the disposition of hazardous dust and spores. Handheld battery cleaners, ideally equipped with HEPA-filters, are recommended for quick and short-notice cleaning to maintain cleanliness even under time pressure. A dust wiping robot is helpful for difficult-to-reach areas if these are sufficiently smooth.

Microfiber cloths allow for effective and quick cleaning, their high efficiency (Meier 2006: 27) originating from electrostatic attraction of the polyester or polyamide fibres (Frank et al. 2013: 233). Within depots, dry-wet cleaning (without detergents, at maximum household soap) should be carried out annually or biannually at maximum. Dry-wet vacuum cleaners are to be avoided as their aerosols may spread spores; similarly vinegar must not be used as the sour pH may foster mould growth. Entry of humidity and dirt into depots, e.g. through clothing, should be minimized. Plants and food are not allowed in the depot (Finne 2013).

(3.1) Object cleaning: The cleaning of objects requires specific preparations and equipment, e.g. a gaze cover for the cleaning tool, finer cleaning tools, brushes, soft microfiber cloth and certain sponges (Masen/Scheerer 2014: 4; Daudin-Schotte et al. 2013: 217) (see devices). Cleaning methods should be specified in line with the requirements and objects and co-ordinated with / supervised by professional conservators. HEPA aircleaners (see devices) may be used as a relatively novel method for preventing the accumulation of dust and spores.

(4) IPM: The definition of IPM as an interdisciplinary, holistic and sustainable approach for the prevention and handling of pest infestation (see e.g. Hammer 2012: chapter 1, Querner 2015 and references there) implies that the measures towards climate control, hygiene and monitoring discussed above constitute a substantive part of IPM. The control of the environment is key for the protection of a collection against mould; a dry (50%±5%, on the object surface < 60%), clean, cool (18±2°C) and well ventilated environment are ideal (Valentin 2007: 5). Biomonitoring, visually and by application of simple yet effective sampling, e.g. by way of bioluminescence, should be carried out twice a year but more frequently in humid climate and in conditions of variable humidity. Simple methods for biomonitoring in museums and archives have been adopted from medicine (Konkol / McNamara / Mitchell 2010: 179; Meier-Wolff 2011; Abe / Murata 2014). The bioluminescence method (see devices), e.g. with the Lumitester PD-20, is a non-invasive, fast (10s) and quantitative method for determining total contamination, measured as ATP energy stored in living germs and AMP energy stored in inactive or dead germs. Despite easy handling, a museum specific introduction into the proper use of the instrument and analysis of results is indispensable (see Hammer 2018: 83 for further detail). Other methods of biomonitoring include the measurement of ergosterol to gauge microbial gaseous substances (mVOCs) (Skóra et al 2015: 394) or measurement by way of sticky tape.

(4.1) Infestation: In case of an infestation one should know strategies for regaining control (see Hammer 2018): (1) Identification, (2) protection, (3) fighting causes (remove sources of humidity, reduce air borne humidity, increase circulation), (4) isolation of objects, (5) inactivation/drying mould, (6) dry cleaning of object and room, followed by (7) control via biomonitoring. These steps should not be delayed or complicated because dealing with the consequences can be associated with considerable financial and non-financial efforts. In conclusion, we note that the use of toxins should be avoided in dealing with mould infestation. This is because they may be ineffective if mould has developed resistance, they are harmful for staff, visitors and often objects themselves, and they do not substitute for careful cleaning, as even dead spores are toxic and allergenic.

For references, details of useful equipment, endnotes and short CV see German version.