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1.08 Objavljen znanstveni prispevek na konferenci
1.08 Published Scientific Conference Contribution

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PREVENTIVE PRESERVATION IN THE ARCHIVES

Abstract:

Budapest City Archives and the Department of Microbiology and Infectious Diseases of the Faculty of Veterinary Science of the Szent István University developed a new method of preventive preservation to examine whether documents are infected by moulds. The paper reports on the application of this method in the laboratories of the Budapest City Archives and how it is based on the MSZ ISO 7954:1999 standard previously unknown in archival practice.

Key words in English:

preventive preservation, mould infection, new method

Izvleček:

Preventivno varovanje arhivskega gradiva

Mestni arhiv Budimpešte in Oddelek za mikrobiologijo in infekcijske bolezni Fakultete za veterinarske znanosti Univerze Szent István so skupaj razvili novo metodo preventivnega varovanja arhivskega gradiva s poudarkom na ugotavljanju okužbe dokumentov s plesnimi. Prispevek podaja poročilo o uporabi te metode v laboratorijih Mestnega arhiva Budimpešte in njenem temeljnem standardu MSZ ISO 7954:1999, slednji je bil v arhivski praksi še precej neznan.

Ključne besede:

varovanje arhivskega gradiva, okužbe s plesnijo, nove metode

1 PREVENTIVE PRESERVATION

There has been an active Conservation workshop in the Budapest City Archives since the 1970s. It includes the bookbinding, restoration, microfilming and digitization tasks. Eighteen people altogether work in this department, which is approximately 20 % of all workers.

In the department, special attention is given to the preventive conservation activity. Moreover, we have continuously developed relationships with record guardian authorities such as courts, hospitals and police archives. There is a possibility for professional counselling in case of records of lasting value that are outside of collecting areas. In addition, we can also purchase records of historical value, or we can deposit them. For example, we have deposited the valuable record and photo material of the Budapest City Protection Association in our archives. Our institution was built following the BS 7554:1999 standard.

We have automatic climate controlled archival storages. Our record storage's capacity is 53 rkm and at present 34 rkm of material is taken into storage. We are continuously converting our warehouse from static to rolling, mobile scaffolding

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warehouses and thereby increasing the building's storage space. We also have safe blast doors, UV protective window tints and our repositories are equipped with dust detectors.

The fellow workers of the conservation department are archival conservationists who are measuring the storage microclimate with portable thermo and humidity meters, especially at the corners and crowded shelves. Due to the fact that elevated spore content is particularly dangerous in the acclimatised space, we also do mould activity measurement semi-annually. In fact, the central climate control transports increased pollutants from one storage to another. The air mixer capacity for fresh air inlet is 10 %. Furthermore, we change the air filters of the air purifiers every 2 years. Besides coarse and fine filters, we also use Hepa filters for the sake of pure, contaminant-free air. The amounts spent on this, are relatively low compared to maintenance and operating costs.

We also strive to dust, demetalizzate, anitplasticize, and repackage bigger and bigger portions of the archives. We have not had dangerous asbestos boxes, though there is some in the 20 % of the paper material in the acidic box. The record keeping departments repackage all the paper material, during the organisational, preparational works on schedule, every year. Furthermore, we repackage 2 rkm material into acid-free, long-term preservation storage devices. This storage devices not only protect the paper material from physical damage, but also decrease the effect of daily climate fluctuations. According to our studies, it takes 7 hours while the document picks up the temperature and the humidity of the storage climate.

Unfortunately, due to the restrictive maintaining budget measures, we cannot sustain the optimal 18-20°C and 45-50 % humidity for the whole year. We have developed a Budapest summer and winter adjusting value, in line with the optimal for the recommended optimum. Diong this, we were able to decrease the running costs significantly. Secondly, we check the display for the storage climate daily, as required we can also apply manual settings. This is done to reduce the degree of fluctuations. The conservation continuously checks the state of the documents and the storage climate with manual measuring instruments. It is also important to mention that the operational and conservational department do not belong to the same head of department.

A demand has emerged in connection to the document delivery to diagnose paper infection. On the one hand, the paper transmitter wanted to hand in the paper material as soon as possible to the archives, on the other hand, the archives wanted to preserve it. The problem is that the record guardian companies do not abide the ordinances for documents for transfer (in large percentage) (7/2002 NKÖM).

2 CLIMATIC CONDITIONS

The recommendations for the storage conditions for different types of archives vary, but they match in that aspect that the more constant the climatic value, the longer their life expectancy will be. From the perspective of archives the parchments, photographic materials are the most vulnerable media (Körmendy, 2009, pp. 555). If the archives can positively influence the climatic values, cleanliness, lighting conditions in the repository for documents the degradation processes of the organic matter can be reduced.

We obtained the relationship between velocity and temperature of the decomposition on the basis of the known Arrhenius equation. Based on this equation

they determine the following relationship: +10°C change of temperature usually doubles the velocity of chemical reactions (Tímárné Balázsy, 1993, pp. 67). Thus, we can protect the cellulose based works of art from degradation at low temperatures and in a 60 % or lower relative air humidity environment.

3 BIODEGRADATION OF CELLULOSE

The bacteria, microorganisms and insects attack the cellulose using enzymes. The goal of microorganisms or insects is to break down the cellulose into sugar or substances that they can pick up as food. This is a hydrolysis, therefore the presence of water is essential.

Sufficient time and favourable 65 % relative humidity is required for the degradation of the fibrous plant materials: cotton and other vegetable fibres. The alkaline environment can also facilitate the degradation of the fibres. The high lignin content slows microbial degradation of cellulosic fibres, due to the fact that it impedes the ingress of moisture into the cell wall (Tímárné Balázsy, 1993, pp. 111).

The acidic pH, high salt concentration, copper and heavy metals and their compounds prevent the bacterial degradation of vegetable fibres. Fungi and bacteria spores can lurk in the material for a long time, even for years, while the ambient humidity is not suitable for spore germination.

Besides 8-10 % humidity, some spore germination is conceivable, though most fungi need at least 70 % humidity. In addition, bacteria need even more humidity for their life activities.

The optimum temperature for bacteria and fungi is 20-30°C, but developing species may also occur at lower temperatures (Kastaly, 2010, pp. 19). Thus, the dust, dark humid environment and the lack of regular exchange of air helps to harbour microorganisms. There are easily biodegradable nutrients that occur on works such as starch, glue and sugars. These accelerate biodegradation.

4 ENZYMES

The enzymes are protein catalysts produced by living organisms - microorganisms. They are capable of accelerating chemical and biological degradation rate of speed million fold. We use Enzymes in the restoration, when we remove aged starch or glue from the books. However, do we know that the recovered fungal amylase enzyme also contains cellulose, which is paper-degrading enzyme? Therefore, restorers have to deal with great care when using enzymes, because in addition to starch it can also degrade paper if one fails to comply with the required parameters.

If we think more about the operation of micro-organisms it is not surprising that are played so fast, as the fungi has (starch- cellulose degrading enzyme), which explains that the paper (cellulose) weathers, fades away in case of mould infection. During mould growth, they produce water, which is an autocatalytic process, which means that it does not require water to supply growth, because it self-produces water.

From this, we can already see that one of the fastest occurring chemical-biological damage is the mould infection. Numerous bacteria and fungi produce hydrogen peroxide. Therefore, the process is also accompanied by an oxidative degradation.

5 YELLOW, YELLOW-BROWN COLOUR

Due to acid hydrolysis and oxidation the crystallinity of the cellulose increases, it becomes brittle. The tensile strength and double folding of the paper decreases. The aldehyde groups that appear in large numbers in cellulose cause the paper's yellow, yellow-brown colour (Tímárné Balázsy, 1993, pp. 100). Besides the acid hydrolysis, some fungi produce coloured pigments that discolour the paper and make the material unreadable. Most of the paper staining fungi belongs to Aspergillus, Peniccillium and Chaetomium species.

6 MICROBIOLOGICAL TESTING

For the examination of mould infection of the paper documents, we have involved external experts from the Budapest University of Technology Department of Chemistry, SZIE-ÁOE Microbiological Department.

A laboratory was commissioned in our archives in 2012, where according to the MSZ ISO 7954:1999 standard, one could perform the examination for the mould sample taken from a paper document. With this examination we can diagnose the mould activity of the paper document.

Our restorers take samples from every questionable cases, before the acquisition of paper archives. After the evaluation in our laboratory, it can be decided if the document can be transported into the archives or not. A 7/2002 NKÖM number of decrees make it clear that the disinfection costs have to be payed by the transmitter companies.

With the mould examination method, one can clearly, by standard, define the active mould infection and the repository mould infections can be avoidable in cases of acquired paper archives. We investigate all the newly transported documents in such way. Naturally, we cannot avoid the biological damage in case of harsh climate changes, floosd or during other cases. This examination method can detect a mould infection. This method not only can be used with paper-based but also with wood-textile-leather based works of art. Therefore, we can avoid the unnecessary chemical disinfection as we get a clear answer for the necessity of the disinfection. It is therefore beneficial for people and for the works of art. Thereby less chemical substance accumulates.

In my further research, I am searching for such a disinfectant that does not have harmful health effects.

A successful relationship with microbiologists has been established and therefore it is anticipated that certain aromatic oils used under specific conditions will disinfect the paper based documents. On the one hand, they only perform manual disinfections with this method. On the other hand, it is not used with massive disinfections.

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POVZETEK

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PREVENTIVNO VAROVANJE ARHIVSKEGA GRADIVA

Arhivsko gradivo lahko pred okužbami s plesnijo zaščitimo tako, da relativno vlažnost v arhivskih skladiščih zadržujemo pod 60 %, jo kontinuirano merimo in zapisujemo, zagotovimo primerno kroženje zraka in konvekcijo ter s tem preprečimo razvoj nevarne mikroklime. Skladišča morajo biti čista in neprašna, filtre je potrebno redno pregledovati in čistiti. Pomembno je, da je arhivsko gradivo pred prevzemom v skladišče pregledano, preveri se morebitna okuženost s plesnijo in izvede mikrobiološka analiza. Vsebnost spor v zraku je potrebno preveriti enkrat mesečno.

Če analize pokažejo prisotnost okužbe s plesnijo, je potrebno takoj vzpostaviti stik s strokovnjaki mikrobiologi. Predvsem je pomembno, da od nevarne rasti mikroorganizmov na gradivu ne pride do splošne kontaminacije gradiva v skladišču. V Mestnem arhivu Budimpešte so leta 2012, v sodelovanju z Oddelkom za kemijo Univerze v Budimpešti, za ugotavljanje plesni na papirnem gradivu vzpostavili laboratorij po standardu MSZ ISO 7954:1999.

Restavratorji v arhivu vzamejo vzorec vsakega sumljivega dokumenta, še preden gradivo prevzamejo v arhivsko skladišče. Po analizi v lastnem laboratoriju pride do odločitve, ali bodo gradivo prevzeli ali ne. Stroške morebitne dezinfekcije nosi ustvarjalec gradiva.

Z metodo ugotavljanja okužb s plesnijo lahko definirajo aktivne okužbe s plesnimi in se tako izognejo morebitnim masovnim okužbam s plesnijo v arhivskih skladiščih. Na ta način pregledajo vse gradivo. Metoda je uporabna tako za papirne dokumente kot tudi za umetnine na lesu, tekstilu ali usnju. Metoda je koristna za ljudi, prav tako pa tudi za kulturno dediščino.

Avtorica poskuša s svojimi nadaljnjimi raziskavami najti tako dezinfekcijsko sredstvo, ki ne bo ogrožalo zdravja ljudi, ki z njim delajo. Prvi rezultati kažejo na primernost določenih aromatskih olj, ki bi pod določenimi pogoji lahko delovali dezinfekcijsko.

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