



# MODERN APPROACH FOR BIODETERIORATION ASSESSMENT AND DISINFECTION OF HISTORICAL BOOK COLLECTIONS

SMALL GRANT CO-FUNDED  
BY INTERNATIONAL VISEGRAD FUND

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# Project team



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# Culture Heritage

Total in V4: **3320**  
museums, archives



# Microorganisms in archive objects' biodeterioration

*Alternaria*  
*Aspergillus*  
*Aureobasidium*  
*Chaetomium*  
*Cephalosporum*  
*Cladosporium*  
*Epicoccum*  
*Penicillium*  
*Stachybotrys*  
*Trichoderma*

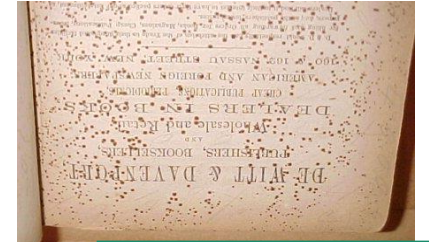
*Bacillus*  
*Cellulomonas*  
*Clostridium*  
*Cytophaga*



musty odour



discoloration



foxing



properties changes



structure losses



powdery decomposition



petrification

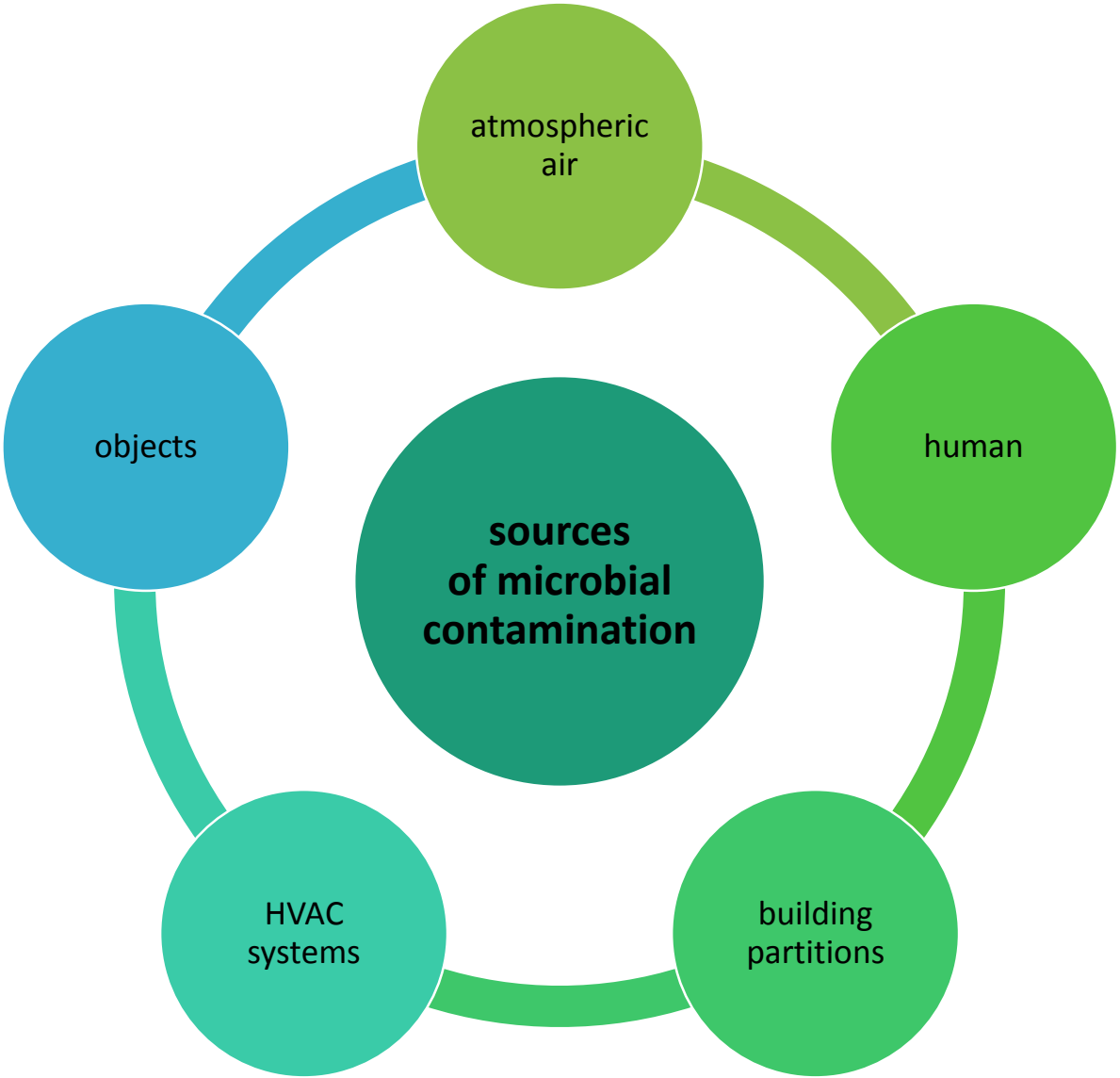


paper defects



biofilm

# Biodeterioration of historical books





# Biodeterioration study of archival

## Mechanical

- structure (SEM, XRD, mechanical study)

## Chemical

- chemical composition (FT-IR, NIR)
- ink (HPLC, SEM-EDX)

## Biological

- **culture-dependent methods**
- **chemical method (MALDI-TOF)**
- molecular methods
  - clone library constructions
  - fingerprinting (DGGE, TGGE, ARDRA, T-RFLP, SSCP, ARISA)
  - **Next Generation Sequencing**
  - RNA analysis



# Disinfection methods

## Physical

- dehydration, gamma irradiation, low-oxygen environments, freezing, refrigeration, high temperature and pressure, ultraviolet radiation, **low-temperature plasma**

## Chemical

- alcohols, phenols, azoles, **essential oils**, quaternary ammonium compounds, acids, ethylene oxide, formaldehyde, **silver nanoparticles**, titanium dioxide

# Disinfection methods



Ethylene oxide fumigation



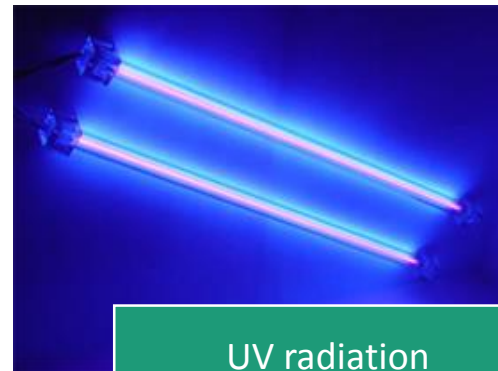
Low-oxygen environment



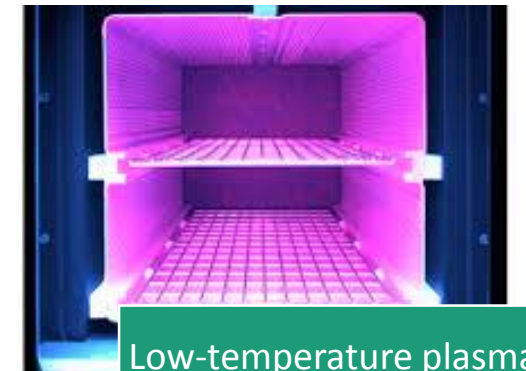
Gamma irradiation



AgNPs misting




UV radiation



Low-temperature plasma





# MODERN APPROACH FOR BIODETERIORATION ASSESSMENT AND DISINFECTION OF HISTORICAL BOOK COLLECTIONS

Duration: 16.11.2015 – 28.07.2016

1. Research aim: identification of microorganisms active in biodeterioration of historical books collection, assesment of the disinfection effectiveness and the effects interaction with paper (5 tasks)
2. Collaboration (science, archives, museums for staff and students), Hungarian partner (?), future application to EU programs, also V4 grants (standard, strategic)
3. Workshops
4. Scientific publications, reports, monographs, conference presentations
5. Promotion of the project (website, social networks, mass media, posters, bulletins)

<http://v4biodeterioration.p.lodz.pl/>

# Schedule

Date	Project task
16.11.2015 – 15.12.2015	<b>1<sup>st</sup> task:</b> The inventory of historical library collections (National Library, National Museum, PL; National Archives, National Library–Klementinum, National Library of Technology, CZ; National Archive, National Library, SK) and the choice of objects with biodeterioration symptoms (SAS, UCT, LUT).
15.12.2015	Deadline to send min. 3 books with visible biodeterioration signs to LUT. Book must have full description (age, place of storage etc.) – the more information, the better.
6.01.2016	Deadline to sign Contract with IVF
15.12.2015 – 15.01.2016	<b>2<sup>nd</sup> task:</b> Assessment of the microbial contamination of all historical books at LUT (cataloguing, culture method). Selection of 3 the most microbially contaminated books for further studies. Those 3 books will be divided into 3 parts and send to partners.
15.01.2016	Deadline to send parts of books from LUT to SAS and UCT.
15.01.2016 – 31.03.2016	<b>3<sup>rd</sup> task:</b> Analysis of microbial biodiversity using high throughput sequencing (Illumina platform) (SAS), MALDI-TOF-MS (UCT) and ITS region (LUT).
31.03.2016 – 1.04.2016	Workshop: 'Methodologies to identify the microflora responsible of biodeterioration of archival documents' in Bratislava, Slovakia.
15.04.2016	Deadline to send detailed report from 1-3 tasks to LUT.

# Schedule

Date	Project task
15.01.2016 – 28.04.2016	<b>4<sup>th</sup> task:</b> Determination of the effectiveness disinfection methods of historical books (non-thermal plasma at UCT; essential oils at SAS, nanosilver misting at LUT). Performing RNA analysis before and after disinfection.
28.04.2016 – 29.04.2016	Workshop ‘Disinfection of historical books collections’ in Prague, Czech Republic.
28.04.2016	Deadline to hand on (personally) the disinfected book parts to LUT.
13.05.2016	Deadline to send detailed report from 4 <sup>th</sup> task to LUT.
31.05.2016	Deadline to write 1 <sup>st</sup> publication from 1-3 tasks (SAS).
28.04.2016 – 03.06.2016	<b>5<sup>th</sup> task:</b> Determination of the influence of disinfection methods on mechanical and optical parameters of historical books at the Institute of Papermaking and Printing, LUT.
3.06.2016	Deadline to prepare detailed report from 5 <sup>th</sup> task (LUT).
29.06.2016 – 30.06.2016	Summary project meeting in Lodz, Poland.
30.06.2016	Deadline to write 2 <sup>nd</sup> publication from 4-5 tasks (UCT).
30.06.2016	Deadline to write Monograph (LUT).
1.07.2016 – 22.07.2016	Preparation of the final report (narrative, financial, audit).
28.07.2016	Deadline for final report and financial settlement

# Finances

No	Items	from Fund				own contribution				Total
		PL	CZ	SK	Sum	PL	CZ	SK	Sum	
1	Printing and publishing costs, delivery	555,00	165,00	0,00	720,00	0,00	0,00	0,00	-	720,00
2	Rent of premises and related technical services	390,00	360,00	400,00	1 150,00	0,00	0,00	0,00	-	1150,00
3	Fees for artists	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,00
4	Fees for experts	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,00
5	Accommodation and board	464,00	480,00	360,00	1 304,00	0,00	0,00	0,00	-	1304,00
6	Transportation costs	171,25	225,77	252,98	650,00	268,72	354,26	397,02	1 020,00	1670,00
7	Translation, interpreting costs	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,00
8	Awards and prizes	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,00
9	Office supplies and consumption material	280,02	707,96	987,02	1 975,00	387,03	445,99	602,98	1 436,00	3411,00
10	PR costs (e.g. advertising)	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,00
11	Website design and update	100,00	0,00	0,00	100,00	218,00	0,00	0,00	218,00	318,00
12	Overheads (max. 15%)	38,73	61,27	0,00	100,00	126,25	199,75	0,00	326,00	426,00
<b>Total</b>		<b>1999,00</b>	<b>2000,00</b>	<b>2000,00</b>	<b>5 999,00</b>	<b>1000,00</b>	<b>1000,00</b>	<b>1000,00</b>	<b>3 000,0</b>	<b>8999,00</b>

# Contact

## Coordinator

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## Partners

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# International Conference of Biodeterioration and Protection of Cultural Heritage

On behalf of the Organizing Committee we are delighted to announce that the **International Conference of Biodeterioration and Protection of Cultural Heritage** is to be held in **Lodz, Poland on September 8-9, 2016.**

The Conference provides the opportunity for discussing various topics in biodegradation as well as the protection of cultural property. The scientific program will range from the biodeterioration of historical buildings and wood, archival documents and historic textiles, biodeterioration of historical objects stored under water to methods of investigation, disinfection and conservation. The Conference will provide the opportunity to present and exchange ideas with prominent scientists and to establish future cooperation with other participants from around the world.

**We look forward to seeing you in September 2016.**

<http://www.biodeterioration2016.p.lodz.pl/>