

WOOD for HEALTH

2nd International Newsletter

Wood for
Health

More wood in European health care buildings!



Queen Silvia Children's Hospital in Gothenburg, Sweden
Picture by Ulrich Hundhausen

Dear readers,

WOOD for HEALTH progressed during its second year to a stage where the first results started to emerge and clear plans for the rest of project time could be drawn. At the beginning of the year, testing of antimicrobial substances for activity was completed, then both established and new binder systems were used to prepare coatings with studied antimicrobial substances. Next, testing of new coatings for technical properties and antimicrobial activity using birch plywood as a coated substrate commenced and continued to the end of year.

In addition to experimental research work, the content of guidelines for use of wood in health care buildings was outlined, and various dissemination activities were carried out as presented later in the newsletter. One of the definitive highlights of the year was the [project meeting in Gothenburg](#), Sweden, and concomitant visit to Queen Silvia's Children Hospital with innovative and pioneering use of wood on indoor surfaces. There is a news article about the visit in the newsletter.

There were also some difficulties during the year, as recruitment of project personnel delayed effective commencing of antimicrobial testing of the coated surfaces. However, the project is well able to obtain its planned milestones and produce deliverables before the end of the project time.

In 2024, there will also be new tasks commencing. Tests of antiviral activities will run from spring to summer. In summertime, the microbiomes on various surfaces in a hospital will be analysed. The water vapour damp diffusion and the moisture buffer value of coated panelling and flooring will be analysed and used for modelling the moisture dynamics and the impact on indoor air. In the autumn, the first draft of guidelines will be completed. Last, but not least, the project will be strongly visible in ForestValue 2 conference in Berlin in October.

Yours sincerely

Pekka Kilpeläinen

Project Manager of WOOD for HEALTH

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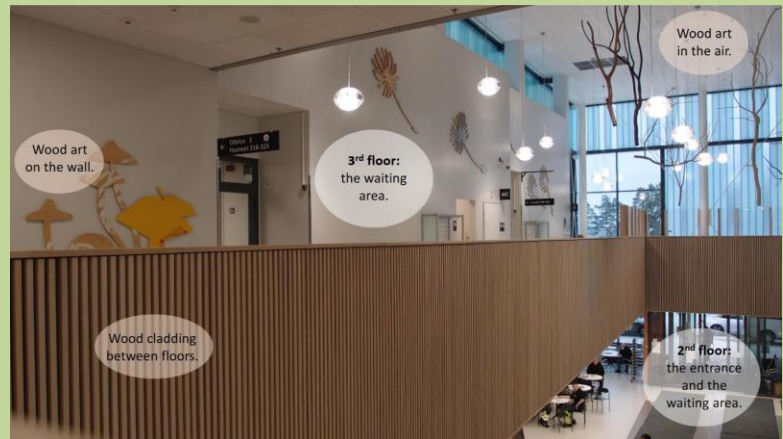
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Follow the project and contact us

The quest for good practice

By **Anna-Johanna Klasander** (White Arkitekter)

To get an overview of state of the art for interior wood in healthcare buildings and other types of environments with demanding hygiene requirements, White Arkitekter together with consortium partner NTI gather good examples to be presented in the final report and the forthcoming guidelines for wood in healthcare buildings.

Our project also aims to map and compare how rules and regulations differ between countries and regions. Since the project has gained due interest among students, we now have a master's thesis connected to our investigations in this broad and diverse field. The MT work is carried out at Norwegian University of Life Science (NMBU).



Entrance and waiting room of the Kainuu Central Hospital in Finland
Picture by Tuomas Niskanen

Crafting sustainable antimicrobial coatings

By **Claudia Schirp** and **Henrik-Alexander Christ** (Fraunhofer Institute for Wood Research, WKI), **Bruno Andersons** and **Dace Cirule** (Latvian State Institute of Wood Chemistry), and **Maris Valdmanis** (Iecavnieks&Co Ltd.)

WP3 develops new antimicrobial and antiviral coatings for hygienic wooden surfaces. For this, several promising candidates of antimicrobial compounds have been selected according to the safe-by-design concept. Their effectivity against pathogens was established in antimicrobial trials carried out in WP4. For incorporation of those compounds into wood coatings, two main approaches are now being followed.

The first approach is the formulation of antimicrobial wood coatings using established binder systems in combination with antimicrobial compounds. For this, three different binder systems namely oil-based coatings and formulations on the basis of established acrylate and polyurethane dispersions are being tested:

The Latvian State Institute of Wood Chemistry, in close cooperation with Iecavnieks&Co Ltd., has developed a solvent-free linseed oil-based formulation for none-film-forming wood coating. Its properties were adjusted so that it is easy to apply and dries quickly, which is a prerequisite for industrial use of the coating. The optimum process for the heat pre-treatment of linseed oil was selected, considering the results of the antibacterial effect, the drying performance, as well as economic aspects. With the aim of making the formulation suitable for ensuring hygienic wood surfaces, work continues on improving the formulation by incorporating additives. Summarizing the results so far, the most promising antimicrobial agent for the linseed oil is nano zinc oxide.

The Auro Pflanzenchemie AG (AURO), in collaboration with Fraunhofer Institute for Wood Research (WKI), have formulated an established acrylate-based binder system with several antimicrobial plant oils as well as silver containing compounds. Additionally, efforts have been made by WKI to integrate the known natural antimicrobial biopolymer chitosan into polyurethane-based wood coatings. For doing so, novel biobased binders that can be stabilized in aqueous media with acidic pH were developed. Wooden samples coated with all these systems are currently under investigation in WP4 and 5.

The second approach of WP3 is concerned with the synthesis of completely new binder systems with inherent antimicrobial and antiviral effects by incorporating fitting compounds directly into their chemical structure. Here, work is led by the lab of Fraunhofer WKI and focused on biobased acrylate- and polyurethane-based dispersions. The most promising chemical strategy identified so far, is a methacrylation of suitable antimicrobial compounds for their subsequent incorporation into the coatings. This was achieved either during polymerization of the acrylate binder systems or during UV-initiated curing of suitable polyurethane-based binders. UV-curable coatings are of interest to the project consortium, for comparison with similar commercial systems that were used in Queen Silvia hospital. Testing of the general coating performances and antimicrobial effects of these novel systems will be the focus of the following months.



Testing stability of the formulations
Picture by Errj Sansonetti

In summary, the mainly biobased and non-toxic resources used in the different coatings and binders that are developed in WP3, should result in environmentally friendly products. To further ascertain our belief in their sustainability, LCAs will be carried out soon in WP5 for the most promising systems.

Steps towards new antimicrobial coatings

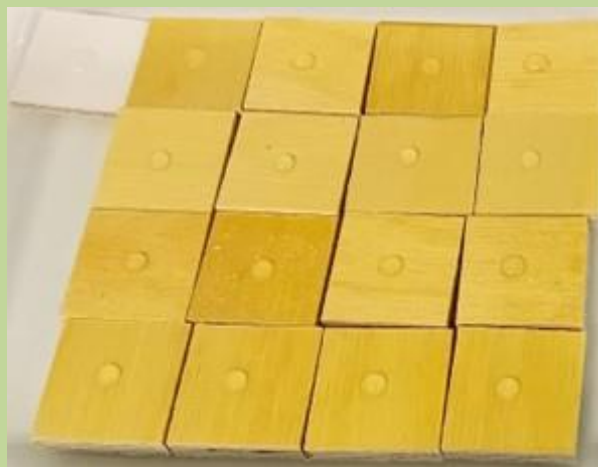
By **Pekka Kilpeläinen** and **Ilse Ekman** (University of Oulu)

The role of WP4 is to support the development of new antimicrobial coatings done in the WP3 by antimicrobial activity analyses and gather more information on the diversity of microbes on the surfaces of healthcare buildings and cleanability of wooden surfaces.

After successfully finishing antimicrobial activity assays for binders and antimicrobial compounds of the WP3, the optimization of antimicrobial activity analyses of the coated wooden surfaces started. Fortunately, the testing is now up to the full speed and preliminary results for the developed coatings, sent from Latvian State Institute of Wood Chemistry, Fraunhofer WKI and AURO, are promising.

The antimicrobial activity assays are done with ~3x3 cm birch plywood pieces coated with the developed products from WP3. In the assay, solutions of bacteria relevant to the hygiene of surfaces in healthcare buildings, e.g. *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, are inoculated on top of the coated plywood and incubated for 4 h in the room temperature. The survival and recoverability of bacteria is assessed through culture and ATP based methods.

The antimicrobial activity assays will continue, and antiviral activity assays will commence during 2024 with parallel studies of determining microbes on the different indoor surfaces of buildings and the cleanability of wooden surfaces.

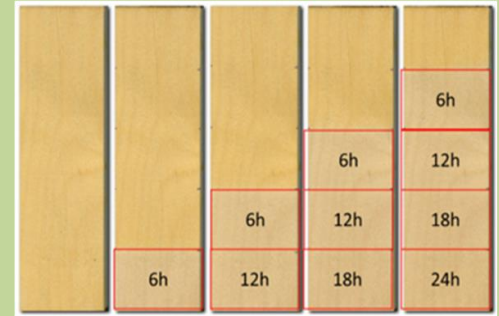


Coatings tested for antimicrobial activity
Picture by Ilse Ekman

Assessing the coating performance

By **Ulrich Hundhausen** (Norwegian Institute of Wood Technology)

The aim of WP5 is to evaluate the essential technical properties of coatings in healthcare buildings, based on the requirement profiles defined in WP2. It is important to note that WP5 does however not include antimicrobial/-viral aspects, as hygiene is central in the project and is therefore addressed in a specific work package (WP4). WP5 includes the characterisation of key properties in healthcare facilities related to surface protection and maintenance. The task includes analyses of the water vapour damp diffusion and the moisture buffer value of coated panelling and flooring. The results are used for modelling the moisture dynamics and the impact on indoor air in a hospital wardroom. Additionally, preliminary life cycle analyses (LCA) and economic assessments are conducted for the new wood coatings.



Testing chemical resistance of coatings

Picture by Ulrich Hundhausen

Following the initial work packages' findings, three coating formulations have been chosen for detailed characterisation. These pilot products are being benchmarked against commercial products used at the Queen Silvia's Children Hospital in Gothenburg, which serves as a reference project in WOOD for HEALTH. A key property for coatings in healthcare facilities is chemical resistance due to strict cleaning and disinfection routines. All tested coatings showed excellent performance against commercial disinfectants typically used in Norwegian hospitals. Another important property is the colour stability of interior wood coatings under light exposure. As expected, coatings based on linseed oil displayed a tendency towards yellowing whereas acrylic and polyurethane based coating showed high light stability. Wood's natural ability to absorb and release water vapour, dependent on the ambient climate, can be employed to moderate indoor air variations. This is known as wood's moisture buffer capacity. A challenge is that wood coatings are necessary to enhance aesthetics and technical properties on the one hand, but may significantly reduce the moisture buffering capacity. The coatings developed in WOOD for HEALTH decrease wood's natural "breathing" like coatings typically do. However, some of the new products have demonstrated good water vapour permeability. We are currently using these permeability values to simulate indoor air conditions in a wardroom at Queen Silvia's Children's Hospital, considering varying levels of wood use in the interior design.

Project Spotlight

By **Bruno Andersons** and **Edgars Kuka** (Latvian State Institute of Wood Chemistry)

We are thrilled to share our excitement as we see that our result reaches a diverse audience that is interested in wood and its applications. Although in the second year of the project the main focus was on the experimental work to develop, characterise, and improve formulations of the antimicrobial coatings, we still managed to be very active in our dissemination activities. Publishing our results in public media, social media and participation in conferences, seminars, social events was worth the effort. Not to mention the release of the 1st WOOD for HEALTH International newsletter, which enabled us in an efficient means to efficiently consolidate essential information into one easily accessible and reader-friendly format that was read by many. Our observations indicate that the dissemination activities effectively and rapidly are communicating the project results on a global scale. In the two-year period, 30 articles were published in public media, 17 messages were shared across various institutional social media platforms, and 9 presentations/posters were presented at international conferences, seminars, and workshops. On our social media accounts (LinkedIn and Facebook), we've published a total of 42 posts covering various project activities, including outcomes of our meetings. Particularly noteworthy is our success on LinkedIn, where 142 people follow our activities, and the posts have received over 5000 impressions.

The project website (www.woodforhealth.eu) during the two-year period has attracted over 340 visitors from 41 countries. The website is where the main projects activities are gathered in one place with frequent updates of the progress, events, news, publications, and more. There you can find the latest information. So, please visit the "home" of the WOOD for HEALTH project and contact us for more information.



Study visit to the point of departure

By **Anna-Johanna Klasander** (White Arkitekter)

In August 2023, the project consortium gathered in Gothenburg for a face-to-face meeting at the office of White Arkitekter. As part of the programme, we took the opportunity to visit Queen Silvia's Children Hospital – the project's point of departure regarding requirements for wood surfaces in healthcare buildings. We were guided around the building by architect Krister Nilsson and civil engineer Pär Andreasson, who both were involved in the design work at White. Staff from the hospital were also there to show us around and tell us how the building functions, both as a work place and a place for the treated children and their families.

The abundance of interior wood surfaces was inspiring to see and gave rise to questions and discussions. Even operation theatres have some wooden surfaces, although only on windowsills. The colourful environments in the reception, corridors, play areas, and staff's lounges and lunch rooms left us visitors with a warm feeling, as did the staff's belief that wood has contributed to the pleasant atmosphere in the hospital.



In the courtyard
Picture by Ulrich Hundhausen



On the balcony
Picture by Ulrich Hundhausen



Inside the operating theatre
Picture by Bruno Andersons



In the hall of the recovery centre
Picture by Ulrich Hundhausen

Miscellaneous news

Communicating with the public during the "Researchers' night" event



We talked at the 5th World Congress of Latvian Scientists "Research Latvia"



Inspiring young minds, a part of the "Shadow day" event



Norwegian wood architecture

By **Ulrich Hundhausen** (Norwegian Institute of Wood Technology)

Norwegian architecture is at the forefront of using wood as construction material, and the annual national conference on wood architecture is an important and popular forum for experts to discuss the latest developments in the field. In 2023, the conference highlighted interior architecture and public health, covering a wide range of topics from the psychological effects to microbial properties of wood products. Ulrich Hundhausen from NTI (Norwegian Institute of Wood Technology) presented the WOOD for HEALTH project and Jens Axelsson from White Arkitekter the design of the Queen Silvia Children's Hospital in Gothenburg; both contributions gained a lot of interest from the auditorium. The conference presentations and discussions in the plenum clearly revealed the benefits and the will of using more wood products in health building but also the need of better product documentation and design guidelines.



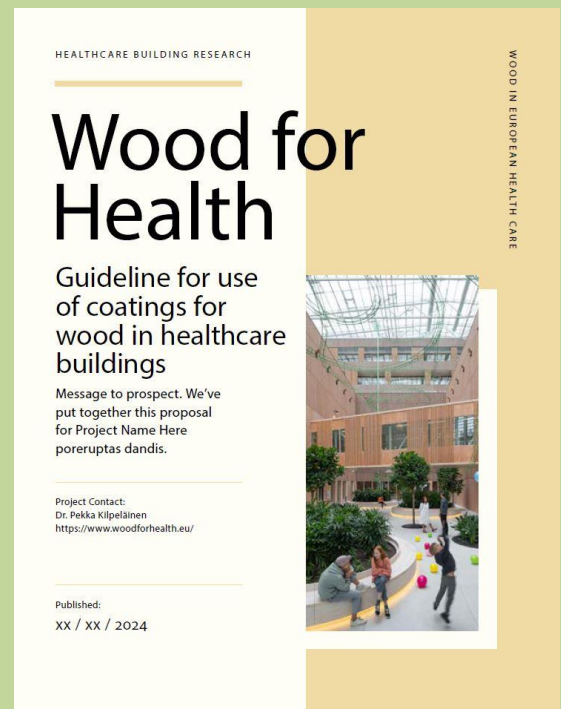
Ulrich Hundhausen presenting at the 9th Norwegian Conference of Wood Architecture
Picture by Knut Werner Lindeberg Alsén

The road ahead

By **Bruno Andersons** and **Edgars Kuka** (Latvian State Institute of Wood Chemistry)

Get ready for an exciting year ahead! We're committed to keeping you in the loop with our latest findings and advancements through the WOOD for HEALTH project's website and social media channels. In 2024, look forward to scientific publications in SCOPUS-indexed journals detailing our findings on the development of wood coatings and their performance. Plus, mark your calendars for opportunities to connect with us face-to-face at conferences and seminars and learn about our progress firsthand.

It is decided that we will participate in the Forest Value 2 organized conference "From WoodWisdom to ForestValue: 20 years pioneering progress in European Forestry & Wood Tech" from 1st to 2nd October in Berlin. You will also see us in the 20th Annual Meeting of the Northern European Network for Wood Science and Engineering (WSE 2024) in Edinburgh. But that's just the beginning! Look forward to engaging with us at public-oriented events like Researchers' Night and organized visits (school excursions, visits for teachers and educators as well as B2B). Keep an eye on our social media platforms for updates on the WOOD for HEALTH 3rd International Newsletter, where we'll delve into our third-year activities. And most excitingly, stay tuned for the unveiling of the first European Guideline for use of coatings for wood in healthcare buildings.



Cover of the Guideline designed by White Arkitekter

Meet the consortium

The consortium is composed of seven partners including a university, three research institutes specialized in different areas of wood research, an architect company, and two coating manufacturers. They bring into the project a high level of expertise in architecture, wood construction technology, wood and coating chemistry, health effects of natural compounds, microbiology, environmental and economic product assessment as well as scientific dissemination and industrial implementation. This is further added and complemented by knowledge and expertise of a number of collaborators from industry and academia, and by interacting with and drawing experiences from real life construction projects.



Partners from academia

University of Oulu (OULU) with its 13 000 students and over 3000 employees is the main university in Northern Finland. Unit of Measurement Technology (MITY) is focused on applied research with notable success: in 2013-19 MITY had the third highest number of Invention Disclosures in UOULU, second only to complete Faculties of Information Technology & Electrical Engineering, and Technology. Biocenter Oulu Virus Core Facility was established in 2006, and offers services both inside of the university and to external customers and collaborators.

The Fraunhofer Institute for Wood Research, (Wilhelm-Klauditz-Institute, WKI) is part of Europe's largest application-oriented research organization, the Fraunhofer Gesellschaft. The department of Binder and Coatings from WKI, covers the entire value chain for the development of wood coatings. Starting from the modification of monomers and polymer synthesis of resins for coatings and adhesives, the formulation of paint mixtures all the way to application techniques and testing and evaluation of finished products. For more than 10 years the research projects focus on the synthesis of resins based on renewables as an alternative to petrochemical raw materials. Next to biobased materials the focus is on additional properties like fire retardancy or antimicrobial properties.

The Norwegian Institute of Wood Technology (NTI) is the R&D Center of the Norwegian wood industry with approximately 130 member companies. Established in 1949, NTI has many years of experience in planning, conducting, and implementing national and international research projects that are essential for the Norwegian wood industry. Besides R&D, NTI's major activities are in the field of contract testing, technical consultancy, certification, and standardization work along the entire value-chain.

The Latvian State Institute of Wood Chemistry (LSIWC), founded in 1946, is a State R&D institute providing research and testing in the field of wood science, wood and polymer chemistry, biotechnology. The main priorities of the multidisciplinary scientific activities are: wood and wood materials with upgraded properties for construction: protection, modification, renovation, maintenance; a biorefinery approach for producing chemicals and products from wood, its components and waste and other types of biomass; obtaining of green chemistry products and green polymers from wood and plant biomass and its processing residues. LSIWC has a long-term experience in the study of wood degradation and protection with the aim to prolong the service life of wood and wood-based materials including development of coating compositions for retaining the wood surface's decorative and physical properties. Beside the technological developments, LSIWC is seriously engaged in the study of wood degradation mechanisms.





Partners from industry

Auro Pflanzenchemie AG (AURO) is a consistent pioneer in the field of ecological natural paints, wood care and cleaning products. Their paints, varnishes, oils, waxes, cleaning and care products made from natural materials are powerful and unique in their combination of quality and ecological orientation. The company was founded in 1983 as a GmbH, in 1998 it was converted into a stock corporation. AURO AG currently employs 45 people, 6 of whom work in research and development. The basic material of modern chemistry essentially consists of the non-renewable raw material crude oil. The material resources of future chemistry are abundantly available in our biosphere: the plants. The AURO company has been building on this raw material concept of the future since 1983.

White Arkitekter (WHITE) is one of Scandinavia's leading architectural practices. They are an employee-owned architecture collective of over 700 employees, with presence in Sweden, Norway, UK, Germany, East Africa and Canada. Their head office is in Gothenburg, Sweden. They work with architecture, urban design, landscape architecture and interior design with a sharp focus on sustainability. Today, about 25 per cent of White's revenue comes from assignments in the healthcare sector and about 190 employees work in healthcare sector assignments. Their own research organization, White Research Lab, enables employees to do practice-based research, development and innovation both in-house and in collaboration with partners in academia, business, authorities, NGOs and others. Wood and Healthcare are two central fields of development within WRL.

Iecavnieks & Co, Ltd (Iecavnieks) is one of the largest cold-pressed oil producers in the Baltics. The brand "Paint Eco" combines natural products for wood surface coating, which includes centuries of knowledge of natural dyes. With reference to ancient linseed oil paint recipes, modern boiled linseed oil product lines were created. The manufacturer's product range includes floor oil, paints, stains, waxes based on vegetable oils as well as boiled linseed oil. The manufacturer offers environmentally and human health friendly products - the Latvian Asthma and Aerology Association has recognized the company's products as suitable for use in rooms where people with allergies or asthma are staying.

We acknowledge the support

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More information in www.woodforhealth.eu

For the latest news and progress follow us on [LinkedIn](#) and [Facebook](#).

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