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Andrea Le Moli

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Developing Models of Digital Dissemination Interface for the “Samothrace” Project

Andrea Le Moli

1. General description of the “Samothrace” project

The Samothrace project is an inter-university hub made up of the four Sicilian universities (Catania, Messina, Palermo, Enna) on the basis of PNRR funds in a consortium with other national partners. The project is aimed at the development and testing of nanotechnologies and divided into four pillars: Energy, Health, Smart Mobility, Environment, Cultural Heritage, Precision Agriculture. The project activity is further divided into a number of specific spokes. The work conducted in this article was carried out within the activities of spoke 9 "Route to Innovation" (R2I) and aimed at the results produced by researchers at the University of Palermo within Spoke 3 "Micro and Nanotechnologies for Smart Sustainable Communities" (S2-COMMs).

2. Activity’s Target

The aim of WP 2.3 of the affiliated partner UNIPA to spoke 9 is “Digital contents creation management according to the project’s state of development”. In this framework, the activity of the milestone 17 was aimed at developing a model for a large-scale and general-use dissemination interface of the scientific results of the project potentially applicable to any spoke. The first activity examines the opportunity offered to a medium-scale online dissemination by the publications produced within the project with reference to the scientific and methodological contribution made by researchers at University of Palermo. This experience serves as case-study to explore the proper methodology and strategies to achieve the general target. As its first step, the timing and effectiveness of the dissemination platform contained on the official project website at https://samothrace.eu/spoke3 was reviewed to explore other and possibly more effective ways to grant the visibility of and access to the results to a more general public and to a larger audience of stakeholders, enterprises, private and public agencies. In

order to find the best way to convey the projects' results and to develop the most effective strategy to ensure them the best visibility, the WP2.3 team will build up a format of Digital Dissemination Interface (DDI) consisting in a series of web pages and submenus (ideally apt to be included in a specific section of the Samothrace's main website) and other Digital Disseminations Devices (DDD) specifically designed to enhance the multidisciplinary work lead by the different research teams and its relapses in terms of good practices and opportunities.

3. Performed Activity in the period

This phase aims at testing the technological opportunities offered by the Digital Dissemination Technologies in order to achieve the best visibility and publicity to the project's results. After the thorough analysis of background sources and literature pursued a first draft of a new Digital Dissemination Interface has been devised and described in this report and now needs to be tested and discussed within the research community. The preliminary step of the construction of the Digital Dissemination Interface (DDI) consisted of a survey of general literature concerning the most diffused Digital Contents Management Strategies and of a benchmarking of the most used procedures among the international scientific editorial pillars (Elsevier, Springer-Nature, Cambridge etc.). The second step was to imagine and devise an agile and effective web structure apt to serve the purpose of a general-addressed scientific dissemination. The third step was to analyze the first results of the scientific research to find a way to populate the raw infrastructure with actual contents to test their usability. This step was pursued as soon as the first contributions appeared since January 2023 and consisted of a detailed analysis of the scientific publications produced to highlight the specific contribution of the researchers and map their distribution in the different departments and areas of expertise. As far as the dissemination-issue in concerned, a throughout analysis of main topics was pursued by trying to enucleate the scientific trends and methodological innovations to convey them in a more informative way, to let research community get an unbiased insight about the project's state of art. In order to design the DDI as an improvement of the current digitalization procedures of the project's results, the timing of the publication of the contents on the project's official website and

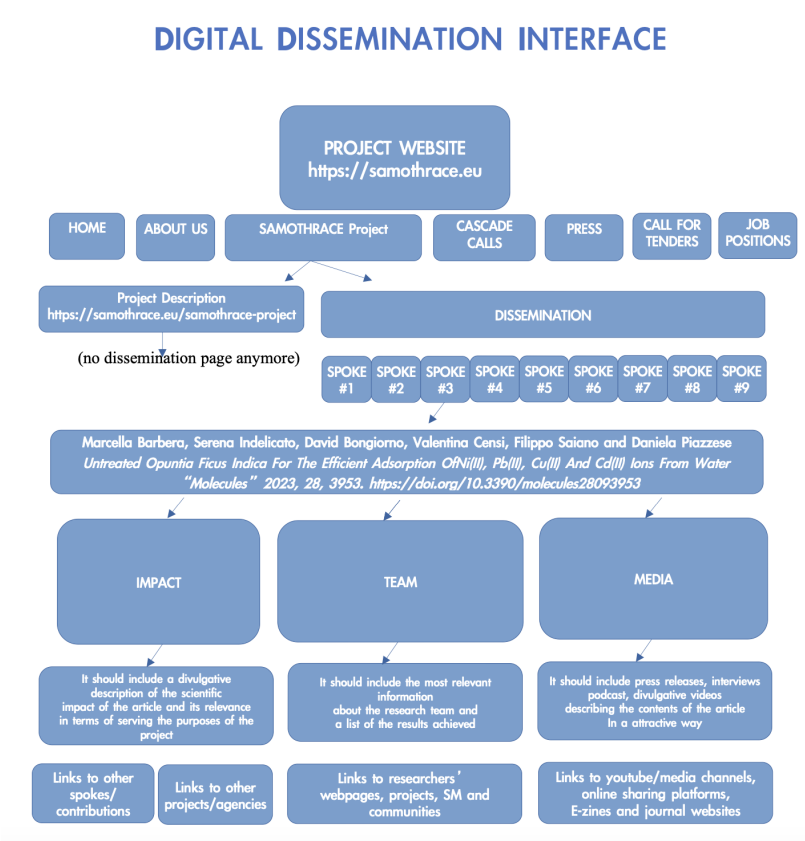
their updating were monitored, as well as the functioning of the links to the publication repositories, the ease of access and the effectiveness of the downloading and open access procedures. The second step was to devise a model of the prospective Digital Dissemination Interface designed around the specificity of the case-study to explore the possibility to apply it to the other areas. The prospective webpages and submenus were initially designed to host a brief and informative survey of the main themes, methodologies and innovations contained in the articles and accompanied by short text- or video- interviews with the authors to render the dimension of team-working experience, multidisciplinary work and concrete life practice. The articles present in the report are those present at the time of writing the report in SPOKE 3 S2-COMMs Micro and Nanotechnologies for Smart Sustainable Communities, headed by the Palermo unit as leading partner. Parallel to the activity of description contained in the static webpages the WP2.3 team has imagined another series of Digital Disseminations Devices (DDD) that could be integrated in the DDI or specifically devised to flank it as separated channels. These devices could include: Content Formats as Text - medium to long form blogs, can be augmented with images, illustrations and graphics; Video - require scripting, subtitles, video footage, still images, graphics and music; also can include Facebook live event coverage etc.; Audio - can include podcasts, audiograms and other forms of audio content like music or sound effects (or a combination of the two, such as footage of a podcast recording); Social - micro content forms created specifically for social media, including audiograms, photo texts, graphics and short lo-fi 'selfie' videos (for example a short clip of the researcher talking directly into a phone about a current topic or event).

4. Achieved results

The analysis of the publications has allowed to assess that the scientific results cover a wide range of studies and applications in the field of nanotechnologies ranging from the contribution of basic physical and chemical sciences in the development of new materials to the search for new application procedures, particularly in the context of medical-health disciplines as well as agricultural, forestry and environmental sciences. According to the WP2.3 team, this consideration should play

a key-role in the devising of the actual DDI as specifically addressed to the general purposes of the project. This should be reflected in the strategies used to build the graphic format of the DDI, which should therefore use templates, colors and modules inspired to the general concepts of "care", "health" and "environment", trying to harmonize with the Samothrace general graphic concepts (a simplified and generalized using of blue shades and nuances used to evoke the surroundings of the seas and the territoriality of Sicily Island). According to these considerations and basing on the analysis of the actual contents that should be displayed on the DDI (which the WP2.3 team considers as a core presupposition of any real Content Management work), the actual structure of the website (as far as the Dissemination issue is concerned) could be restyled and the following structure of the DDI could be imagined as preliminary step of any future work of the WP. The general aim of this infrastructure should be to enhance and valorize the impact of the contributions and the status of the researcher in the international community to give visibility and publicity to the projects' results and so attract more potential partners and stakeholders. Some detailed examples of prospective managed contents referring to the "Impact" and the "Media" sections of the DDI are reported in the document 1 and document 2 attached to the present document. The first one containing some informative description of the articles, the second one reporting two interviews with the corresponding authors of two different UNIPA research teams who give back their experience in the Samothrace project in terms of cherishing good practices/opportunities and to warn about potential treads and troubles.

The general structure of the DDI is displayed in the figure 1 below:


DIGITAL DISSEMINATION INTERFACE
PROJECT WEBSITE
https://samothrace.eu
HOME
ABOUT US
SAMOTHRACE Project
CASCADE CALLS
PRESS
CALL FOR TENDERS
JOB POSITIONS
Project Description
https://samothrace.eu/samothrace-project
(no dissemination page anymore)
DISSEMINATION
SPOKE #1
SPOKE #2
SPOKE #3
SPOKE #4
SPOKE #5
SPOKE #6
SPOKE #7
SPOKE #8
SPOKE #9
Marcella Barbera, Serena Indelicato, David Bongiorno, Valentina Censi, Filippo Saiano and Daniela Piazzese
Untreated Opuntia Ficus Indica For The Efficient Adsorption OfNi(II), Pb(II), Cu(II) And Cd(II) Ions From Water
"Molecules" 2023, 28, 3953. https://doi.org/10.3390/molecules28093953
IMPACT
TEAM
MEDIA
It should include a divulgative description of the scientific impact of the article and its relevance in terms of serving the purposes of the project
It should include the most relevant information about the research team and a list of the results achieved
It should include press releases, interviews podcast, divulgative videos describing the contents of the article In a attractive way
Links to other spokes/ contributions
Links to other projects/agencies
Links to researchers' webpages, projects, SM and communities
Links to youtube/media channels, online sharing platforms, E-zines and journal websites

5. Remarks/Treads

The following considerations concern the possible areas of improvement of the only dissemination tool implemented in the Samothrace's general website so far. In general, the publication of articles on the project website is punctual and respects deadlines. Their placement within the menus is not very precise as the articles can be reached in two ways: 1. through the "Dissemination" item of the "Samothrace Project" submenu which is generic and wrongly placed next to the "About Us" and " Home" (which itself contains an "about"). From within the "Dissemination" item, the publications of the various spokes are placed in columns which are each divided into pages accessible via "previous-next" links which are counterintuitive as the articles are ordered from the most recent to the oldest and therefore by clicking on "next" you actually go backwards in the order of publications and not forwards; 2 also via the "Project Description" item which appears together with the already analyzed "Dissemination" in the same submenu. In this case, to get to the articles you need to click on the individual spokes and scroll down the entire page until you find the "Dissemination" section which contains a sort of duplicate of the previous section with the difference that here the articles are present all together and not in subpages, thus offering more immediate accessibility. The access to the articles is effective with the possibility of viewing both the .pdf file of the contribution in its original repository and downloading it directly via the "download" option. In all cases examined, the open access requirement appears to have been respected. This setting could be seen as extremely basic and barely sufficient even at a starting point of the project and it is opinion of the WP2.3 team that the whole interface should be improved ad restyled in order to grant the best valorization to the project's results. In concluding these remarks, the general ability of the dissemination infrastructure so far can be considered sufficient but surely improvable. The first way to optimize these procedures could be the organization at the beginning of 2024 of a workshop on Digital Dissemination led by the WP2.3 team to inform the research teams about the strategies and techniques proposed and developed in the DDI format and described in this report, which could also be distributed. During the workshop the main topics of the report could be discussed, and it would also be possible to gather opinions and inputs about the

best way to effectively disseminate the project's results according to the specificity of every single area of expertise and knowledge.

6. General survey of the state-of-the-art with a detailed analysis of scientific topics and distribution of research contribution among Unipa Departments

The editorial placement of the contributions appears generally excellent, including contributions in many of the main international magazines in the sector. The vocabulary used in the contributions is obviously very specialized and therefore requires parallel work to disseminate the results even beyond the narrow scope of comparison of particular scientific communities. As points of interest that could be identified to begin conveying the important results to the general public, we can identify first of all 1. the demonstrated impact of new nanotechnologies in the development of innovative diagnostic and therapeutic procedures with particular attention to the recent pandemic experience; 2. the potential impact of new nanotechnologies in the implementation of innovative strategies for environmental protection and valorisation of natural resources and territories.

Starting from 13 January 2023, 7 scientific articles have been produced which saw the participation of 29 UNIPA researchers including correspondents and participants of the research groups who authored the publication. The dissemination work began with a review published in "Pharmaceutics" entitled *Chemopreventive and Anticancer Role of Resveratrol against Oral Squamous Cell Carcinoma*, the result of the interdisciplinary work of five Unipa researchers belonging to the Departments of Surgical, Oncological and Stomatological Disciplines and Sciences and Technologies Biological, Chemical and Pharmaceutical. On February 19, an article entitled *Release Profiles of Carvacrol or Chlorhexidine of PLA/Graphene Nanoplatelets Membranes Prepared Using Electrospinning and Solution Blow Spinning: A Comparative Study*, the result of the joint work of three researchers from the Engineering Departments, was published in "Molecules". and Agricultural, Food and Forestry Sciences. On March 29, five researchers from the Department of Agricultural, Food and Forestry Sciences produced, in collaboration with a colleague from the Laboratory of Industrial Microbiology, Faculty of Sciences, National University of Colombia, an article on

"Plants" entitled *Development of an In-Field Real -Time LAMP Assay for Rapid Detection of Tomato Leaf Curl New Delhi Virus.* On April 21, three researchers from the Department of Engineering published an original paper in the "Journal of Polymers and the Environment" entitled *Biodegradable Membrane with High Porosity and Hollow Structure Obtained via Electrospinning for Oil Spill Clean up Application.* On May 6, 5 researchers from the Department of Biological, Chemical and Pharmaceutical Sciences and Technologies in collaboration with a colleague from the Institute for the Study of Nanostructured Materials (ISMN), National Research Council (CNR) published in the "International Journal of Molecular Sciences" an article entitled *In Silico Design of New Dual Inhibitors of SARS-CoV-2 MPRO through Ligand- and Structure-Based Methods.* On 6 May 8 researchers distributed between the Departments of Surgical, Oncological and Stomatological Disciplines, Biological, Chemical and Pharmaceutical Sciences and Technologies and Health Promotion, Maternal and Child, Internal and Specialized Medicine of Excellence "G. D'Alessandro", in collaboration with a colleague of the Institute for the Study of Anthropogenic Impacts and Sustainability in the Marine Environment, National Research Council (IAS—CNR) of Campobello di Mazara have published an article in the "International Journal of Molecular Sciences " entitled *Multicomponent Antibiofilm Lipid Nanoparticles as Novel Platform to Ameliorate Resveratrol Properties: Preliminary Outcomes on Fibroblast Proliferation and Migration.* Finally, on May 8, 6 researchers distributed between the Departments of Earth and Marine Sciences, Biological, Chemical and Pharmaceutical Sciences and Technologies and Agricultural, Food and Forestry Sciences produced an article on "Molecules" entitled *Untreated Opuntia ficus indica for the Efficient Adsorption of Ni(II), Pb(II), Cu(II) and Cd(II) Ions from Water.*

The first publication produced concerns an application of nanotechnology research to the development of anti-cancer drugs. In particular, oral squamous cell carcinoma (OSCC) is one of the most common and aggressive head and neck tumors, characterized by high morbidity and mortality. Available conventional treatments suffer from numerous adverse effects and are often ineffective in terms of survival rates. Therefore, the search for new therapeutic agents and adjuvants is of utmost importance for modern society. Natural polyphenolic compounds have recently emerged as promising chemopreventive and

anticancer agents. Specifically, the natural compound resveratrol (RSV) has recently gained momentum for this purpose. It is useful for the treatment of OSCC thanks to its antiproliferative, antimetastatic and proapoptotic effects. Furthermore, RSV acts against tumor cells by cooperating synergistically with chemotherapeutics, overcoming drug resistance phenomena. Despite these broad-spectrum effects, there are few specific investigations of the effects of RSV against OSCC animal models that consider different routes and vehicles for RSV administration. The review offers a comprehensive overview of the in vitro and in vivo effects of RSV and its main derivative, polydatin (PD), against OSCC-related cell lines and animal models, with the aim of guiding the scientific community regarding concerns RSV and the use of PD in the treatment of oral precancerous and cancerous lesions.

The second contribution directly addresses the comparison between two of the most widespread techniques for the production of nanoplastics, in particular nanofibrous membranes. These are often the main components used to produce controlled release devices and are often prepared by electrospinning (ES). However, ES requires high production time and cost and is not easy to scale. Recently, solution blowing (SBS) has been proposed as an alternative technique for the production of nanofibrous membranes. In this study a comparison between these two techniques is proposed. The results revealed that both ES and SBS nanofibrous mats achieved controlled release for up to 500 hours. In detail, the lower wettability of the SBS system allowed the CRV release kinetics to be slowed down, compared to that obtained for ES membranes. In contrast, with SBS, a faster release of CHX can be achieved due to its more hydrophilic behavior. Furthermore, the addition of graphene nanoplatelets (GNPs) led to a decrease in wettability and allowed a slowdown of the release kinetics in the whole system.

The third article concerns the development of a particular diagnostic procedure for the prevention of New Delhi tomato leaf curl virus (ToLCNDV). This disease represents a threat to economically important horticultural crops. A real-time loop-mediated isothermal amplification (LAMP) assay was developed for the detection of ToLCNDV in the field, coupled with a rapid sample preparation method and tested in both field and laboratory conditions on samples of courgettes, tomatoes and peppers. The developed real-time LAMP assay is a rapid,

simple, specific and sensitive technique for the detection of ToLCNDV and can be adopted as a routine test, both for field and laboratory conditions.

In the fourth contribution, some techniques for the production of nanoplastics to be used for the treatment of waste water and therefore to be used in particular cases of environmental pollution are addressed in detail and with the help of innovative experimental procedures. The use of biodegradable polymers for the production of membranes for use in wastewater treatment has attracted growing interest considering the possibility of reducing the risk of second pollution. In this work, porous fibrous membranes based on mixtures of polylactic acid and polyethylene oxide (PEO) were prepared. Process, properties and structural relationships of the devices were analyzed through rheological, morphological, mechanical and surface characterizations. Furthermore, the influence of different porous structures on the oil absorption capacity and reusability of the membranes was evaluated. The results reveal that different porosities lead to a variation in the mechanical performance of the membranes, their wettability and, consequently, their oil spill cleanup ability. Membranes obtained with SS showed higher performance in oil removal than DS ones, due to their hollow structure and larger surface area.

The fifth contribution impacts one of the most urgent and current issues, namely the procedures to be developed quickly to deal with the risks of the COVID-19 pandemic and therefore as a general instance of reaction to the emergence of new and unexpected pathologies. The chemical process under study is the viral master protease, one of the main targets among all the key enzymes involved in the life cycle of SARS-CoV-2. We identify two sets of small molecules with significant affinity for SARS-CoV-2 MPRO using a hybrid virtual screening protocol, combining ligand- and structure-based approaches with multivariate statistical analysis using the Biotarget Predictor tool.

The sixth contribution adds to the current framework of experimentation of clinical and diagnostic procedures the aspect of the "nanoplastic" construction of the same organic cells as a key to developing new therapeutic procedures. In particular, the well-being of the skin and mucous membranes is fundamental for the body's homeostasis and it is therefore essential to treat any injury quickly and correctly. From this perspective, molecules such as polyphenols could assist and

promote the success of the wound healing process by reducing the inflammatory cascade and the production of free radicals. However, they have disadvantageous physicochemical properties, which determine their limited clinical use. In this work, a complex mixture of PEGylated lipids, glyceryl monoester, 18-β-glycyrrhetinic acid, and menthol was designed to once again trap resveratrol (RSV) as the active ingredient and further produce lipid nanoparticles (LNPs). The nanosystem was therefore tested according to innovative procedures and techniques that could represent a valuable RSV delivery platform for wound healing purposes.

The last contribution produced so far integrates the transversal, multidisciplinary and particularly attentive to the impact on the territory scenario that characterizes the participation of the Unipa scientific departments with a study on the raw cladode of Opuntia ficus indica (OFI, our prickly pear) as a potential sustainable biosorbent for the removal of heavy metals (Ni, Pb, Cu and Cd) from aqueous solutions. The results of this work highlight the concrete possibility of using the untreated OFI cladode as an economical and ecological biosorbent for the removal of heavy metals from contaminated aqueous solution.

7. Conclusion

In general, the scientific publications that has been delivered so far confirm the multidisciplinary and transversal commitment of the Unipa Departments and the good pool of researchers involved in working on concrete and effective synergies between the disciplinary areas. The realization of these synergies is made possible by the framework of the Samothrace project and its ability to offer spaces of intersection between basic and applied research within the framework of a general interest in health and care of the body, the environment and the territory.

The development of interdisciplinary and effective strategies for disseminating results therefore becomes a key point for the valorisation of the project results including communication to the general public as well as to ever new potential industrial and commercial partners. The work should now be carried on further to explore the trainability and usability of the DDI in order to cover all the project's areas of expertise.

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Andrea Le Moli
Università degli studi di Palermo
andrea.lemoli@unipa.it