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Introduction

Saltpans play an important role in the preservation of wetlands and are important places for birds, as they are used for nesting, resting and feeding.

These spaces set together natural and human resources with high potential that can be exploited through new approaches to traditional products, the development of new products and new activities for the valuation and monetization of these natural areas.

With the decline of the salt activity and consequent abandonment of the saltpans there is a whole natural, cultural and historic heritage disappearing, including important wetlands, ethnographic values and a unique ancestral knowledge.

Under the project ECOSAL ATLANTIS, there have been two editions of the Workshop “Clays, Health and Wellness” aiming at analysing “Clays” as a potential resource used in medicine and dermocosmetics. The first edition was held on November 7, 2011, in the Pedagogical Complex auditorium of the University of Aveiro and at the thermal resort of Caldas da Saúde and the second edition was held on May 21, 2012, at Hotel Onix (in Viseu) and Alcafache Thermae.

Both editions of the workshop allowed the presentation of the latest results of research on clays, namely the studies directed to the physical and chemical properties of sands and special clays traditionally used as healing materials. Participants were intended to have access to:

- Information for the evaluation of relevant properties, particularly chemical and mineralogical composition, ionic changes and exchangeable ions, specific heat capacity and diffusive heat of some mineral raw materials, such as special clays related to thermal activity; special sands traditionally considered to have good curative properties for the treatment of orthopedic, rheumatic, dermatological and physiatric diseases;
• Information for an elementary understanding of the assessment of global radioactivity and identification and quantification of radionuclides in natural clays used in pharmaceutics, balneotherapy and dermocosmetics;

• Information on the preparation and quality control for manipulating clay based products for balneotherapy, dermo-pharmaceutics and dermocosmetics;

With the development of this workshop, we intended to further identify and put in some discussion on the characteristics of the materials underpinning the growing consumer preference for nature therapy treatments. Works were therefore presented in the area of geomedicine and nature therapy involving the use of minerals such as clays and salt, or mineral resources such as seawater and thermal waters, in treatment methodologies as diverse as phytotherapy, hydrotherapy, pelotherapy, thermotherapy, etc..

As an example we can mention the treatments with muds "mud therapy" (using mud or clay - both pelitic geological materials) for internal and external applications, for rheumatic, physiatric, orthopaedic and dermatological diseases. Some of the most common methods of treatment were demonstrated, particularly with the application of a “Peloide” cataplasm, obtained after the maturation of clay and thermal water.

In thermal resorts and spas these applications are indicated for the therapy of rheumatism, arthritis and bone-muscle traumatic lesion (also due to sports performances), for the treatment of skin diseases as acne, seborrhea and psoriasis, in cleaning cosmetic masks and mud-water aesthetic baths for the restoration of lipodystrophy and cellulite treatment.
Programme

The structure that was proposed for this workshop, according to the goals, fits a sequence of moments as follows:

1st Edition | 05 November 2011
9.00 - Opening – Filomena Martins
9.15 - Curative Clays – Fernando Rocha
9.45 - Specification of Clays to be used in Medicinal Products and Cosmetics – Alberto Lopez Galindo
10.15 - Use of Clays in Cosmetics and Medicinal and Cosmetic Products – Cesar Viseras
10.45 - Coffee Break
11.00 - Beneficiation Processes of Geomaterials for Curative Purposes - Fernando Almeida
13.30 - 14.30 Lunch
14.30 - Departure to Caldas da Saúde Thermae
16.00 - Visit of the thermal resort
16.30 - Presentation of the thermal resort – João Coutinho
16.45 - Cases of Study of Bone-muscle Pathologies – Ramiro Valentim
17.00 - Dermocosmetic Treatments with Clays - Carla Moreira
17.15 - Treatment for Bone-muscle Pathologies Demonstration
17.45 - Dermocosmetic Treatment Demonstration
18.00 - Conclusions and work closure
18.30 - Departure to Aveiro

2nd Edition | 25 May 2012
1st Session
10.30 - Workshop Opening - Filomena Martins and Fernando Tavares da Rocha
2nd Session
10.45 - Commercial Clays for Dermatological Application: Relevant Characteristics - Ana Quintela
11.00 - Composition and Specification of Clays Used for Health: Present Situation - Alberto Galindo
11.15 - Discussion
11.30 - Coffee Break

3rd Session
11.45 - Current Challenges of Clay Uses for Medical and Cosmetic Purposes - Cesar Viseras
12.00 - Saltpans Muds Beneficiation for Curative Purposes - Fernando de Almeida and Jorge Hamilton
12.15 - Importance of Medical Hydrotherapy in Portugal from the View of a Hydro-geologist - Martins Carvalho
12.30 - Discussion
13.00 - 14h45 – Lunch at the Hotel
4th Session
15.00 - Visit of Alcafache Thermae
15.30 - Cataplasm Treatment Demonstration - Comments by Sara Rocha
15.30 - RHASSOUL Clay Treatment Demonstration - Comments by Fernando Rocha
16.30 - Discussion and work closure
17.00 - Departure to Aveiro
**Dissemination**

One goal of the ECOSAL ATLANTIS project involves the research associated to the resources of Atlantic saltpans spaces and, thus, it also includes their sustainability as spaces incorporating and/or generating different resources (clays, seaweed, salt, hyper saline water). Both editions were directed to a previously selected audience associated with the areas of medicine, physiatry, physical therapy, health and wellness. Accordingly we made a strong public dissemination to these different publics by sending invitations, mailing list and social networks like Facebook. We may underline the dissemination made using the mailing list of the Portuguese Association of Physiotherapists and the Interested Group in Hydrotherapy. Despite the focus on specialized publics, a disclosure of the event (in both editions) was developed on the Internet, particularly on the project page ECOSAL ATLANTIS, thus responding to the ECOSAL ATLANTIS project objectives. In the 1st edition, disclosure was made in press releases of the Jornal Online of the University of Aveiro, on Portugal Mail - Content Factory, in Vida Rica – Fábrica de Conteúdos, on Cienciapt and on the website of Carla Moreira School of Hydrotherapy and SPA. Regarding the 2nd edition of the workshop, disclosure was made in press releases of the Jornal Online of the University of Aveiro, on the websites of the Portuguese Association of Physiotherapists, the Interested Group in Hydrotherapy and on the Bulletin of the Portuguese Association of Physiotherapists.
Invited entities

For the first edition, 73 invitations were sent, resulting in 21 participants. (Table 1).

Table 1 – 1st Edition Participants I 05 November 2011

<table>
<thead>
<tr>
<th>Participant</th>
<th>Occupation</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adosindo Ferreira</td>
<td>Technical Director</td>
<td>Caldas da Saúde Thermae</td>
</tr>
<tr>
<td>Artur Almeida</td>
<td>Superior Technician</td>
<td>Turismo Centro Portugal</td>
</tr>
<tr>
<td>Adan Monteiro</td>
<td>General Public</td>
<td></td>
</tr>
<tr>
<td>Alcino Oliveira</td>
<td>Researcher</td>
<td>University of Trás-os-Montes e Alto Douro</td>
</tr>
<tr>
<td>Carla Correia</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Carla Moreira</td>
<td>Health and Wellness Technician</td>
<td>Carla Moreira Hydrology School</td>
</tr>
<tr>
<td>Ana Madaleno</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Cristiana Costa</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Graça Leandro</td>
<td>General Public</td>
<td></td>
</tr>
<tr>
<td>Gilberto Cardadeiro</td>
<td>Health and Wellness Technician</td>
<td></td>
</tr>
<tr>
<td>Maria Conceição Almeida</td>
<td>General Public</td>
<td></td>
</tr>
<tr>
<td>Maria Manuela Inácio</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Mariana Rebelo</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Maria Alice Antunes</td>
<td>Physiotherapist</td>
<td>Infante D. Pedro Hospital</td>
</tr>
<tr>
<td>Luísa Silva</td>
<td>General Public</td>
<td></td>
</tr>
<tr>
<td>Francisco Amado</td>
<td>Director of the Health School of the University of Aveiro</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>João Coutinho</td>
<td>Clinical Director</td>
<td>Caldas da Saúde Thermae</td>
</tr>
<tr>
<td>Walid Hajjaji</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Ramiro Valentim</td>
<td>Orthopaedist</td>
<td>Caldas da Saúde Thermae</td>
</tr>
<tr>
<td>Rui Costa</td>
<td>Director of the Degree in Physiotherapy at the Health School of the University of Aveiro</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Slavka Andrejkovicava</td>
<td>Researcher</td>
<td>University of Aveiro</td>
</tr>
</tbody>
</table>
For the second edition the invitations were sent primarily via associations’ mailing lists, an approximate number of 700 invitations, resulting in 20 participants (Table 2).

Table 2 – 2nd Edition Participants | 25 May 2012

<table>
<thead>
<tr>
<th>Participant</th>
<th>Occupation</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelino Costa</td>
<td>Physiotherapist and Teacher</td>
<td>Bairro do Rosário College</td>
</tr>
<tr>
<td>Adriano Neto</td>
<td>Doctor</td>
<td>Rheumatology Portuguese Institute</td>
</tr>
<tr>
<td>Ana Fonseca</td>
<td>Spa Manager</td>
<td>Alcafache Thermae</td>
</tr>
<tr>
<td>Andreia Rocha</td>
<td>Physiotherapist</td>
<td>Portuguese Association of Physiotherapists</td>
</tr>
<tr>
<td>António Abrantes</td>
<td>Teacher of the course of Thermae Technician</td>
<td>S. João do Estoril Secondary School</td>
</tr>
<tr>
<td>António Fernandes</td>
<td>Physiotherapist</td>
<td>Estoril Thermae</td>
</tr>
<tr>
<td>Arslon Shahbaz</td>
<td>Researcher</td>
<td>Geosciences Department of the University of Aveiro</td>
</tr>
<tr>
<td>Cristiana Costa</td>
<td>Researcher</td>
<td>Geosciences Department of the University of Aveiro</td>
</tr>
<tr>
<td>Cristiana G. Martins</td>
<td>Physiotherapist</td>
<td>Nutrémia e G. D. of Caldelas</td>
</tr>
<tr>
<td>Fátima Jerónimo</td>
<td>Physiotherapist</td>
<td>Dª Estefânia Hospital</td>
</tr>
<tr>
<td>Fernanda Silva</td>
<td>Head of professional course in thermalism and Vice-Director</td>
<td>S. João do Estoril Secondary School</td>
</tr>
<tr>
<td>Jorge Loureiro</td>
<td>Board of Directors President</td>
<td>Alcafache Thermae</td>
</tr>
<tr>
<td>Liva Dzene</td>
<td>Master student</td>
<td>University of Aveiro</td>
</tr>
<tr>
<td>Magda Escada</td>
<td>Superior Technician for Tourism</td>
<td>Tondela City Hall</td>
</tr>
<tr>
<td>Maria Cândida Monteiro</td>
<td>Doctor</td>
<td>Rheumatology Portuguese Institute</td>
</tr>
<tr>
<td>Ricardo Santos</td>
<td>Physiotherapist</td>
<td>Alcafache Thermae</td>
</tr>
<tr>
<td>Silvia Ferreira</td>
<td>Thermae Director</td>
<td>Alcafache Thermae</td>
</tr>
<tr>
<td>Sónia Pinto</td>
<td>Superior Technician</td>
<td>Figueira da Foz City Hall – Project Partner</td>
</tr>
<tr>
<td>Susana Correia</td>
<td>Wellness Technician</td>
<td>Korpo de Sonho</td>
</tr>
<tr>
<td>Tânia Malaquias</td>
<td>Physiotherapist</td>
<td>Alcafache Thermae</td>
</tr>
</tbody>
</table>
Invitations were therefore sent to different audiences, particularly in the areas of health and wellness, medicine, physiotherapy and tourism, in order to meet the goal of capturing audiences of various specialties, which was scheduled for this action. The project partners were also invited so that they could learn different approaches to capture different publics, which could be replicated in their workplaces if they considered it to be relevant in the context of actions to be developed in the future.

The dissemination format was changed between the first and second editions, which resulted in greater efficiency in catching specialized public for the workshop second edition.

**Description of the action**

The structure of the action was readjusted from the first to the second edition. The first edition was developed at the University of Aveiro in the morning, with the presentation of the communications by invited experts, and at the Caldas da Saúde Thermae (Sto. Tirso), in the afternoon with the technical session. It began with a brief opening of the workshop by the coordinator of the project at the University of Aveiro, Filomena Martins, followed by the presentations according to the order previously stipulated for the communications (1st Edition program): Fernando Rocha “Argilas Curativas” (Curative Clays); Alberto Galindo “Specification of clays to be used in medicinal products and cosmetics”; Cesar Viseras “Use of clays in cosmetics and medicinal and cosmetics products”; Fernando Almeida "Beneficial processes of geomaterials for curative purposes"; Martins Carvalho "The importance of medical Thermalism in Portugal, from the hidrogeologist’s point of view". In the afternoon, the technical session was held at the Caldas da Saúde Thermae, starting with a guided tour to the spa by Adosindo, technical director, followed by the presentations of João Coutinho (Clinical Director) regarding the available treatments, Ramiro Valentim, an orthopaedist, with the submission of studies for the treatment of musculoskeletal pathologies using clays, and, finally, Carla Moreira (responsible for the Carla Moreira School of
Hydrology) on the application of clays in the dermocosmetic field. Demonstrations were also performed on the application of a poultice in the dorsal and cervical area, and the application of a facial mask of clay. The meeting was closed by Fernando Rocha (scientific coordinator of the workshop) forecasting the possibility of the development joint work in the future. The second edition has been developed at Hotel Ónix in Viseu, in the morning, and at the Alcafache Thermae in the afternoon for the technical session. After a brief opening of the workshop by faculty members of the UA responsible for the project, and the scientific coordination of the workshop, respectively Filomena Martins and Tavares da Rocha, the session was followed by the presentation of invited experts in accordance with the order previously stipulated for the presentation of communications, namely: Ana Quintela "Clays marketed for dermatological application: relevant characteristics"; Alberto Galindo "Composition and characterization of clays used for medicinal purposes: current situation; Cesar Viseras "Current challenges on the use of clay for medicinal and cosmetic purposes"; Fernando Almeida and Jorge Hamilton "Improvement of saline sludge for curative purposes"; Martins Carvalho "The importance of medical Thermalism in Portugal, from the hydrogeologist's point of view". The technical session started with a guided tour to the Alcafache Thermae by Leal Loureiro, (Chairman of the Board of Directors) and by Silvia Ferreira (Thermal Director), followed by two demonstrations of treatments: application of a poultice with clay for musculoskeletal pathologies, and application of the RHASSOUL clay (Morocco) for dermocosmetics. The workshop ended with a small space for debate and closure of the works.
Presentations by the specialists

Having been defined that the second edition would be focused on the dissemination of some results of studies that are being developed at the University of Aveiro, its communications began with the one by Ana Quintela, replacing Fernando Rocha - first edition. The other speakers presented communications in both editions, and in the second edition there was a presentation of the work's progress, already with some results.

In the communication "Curative Clays", presented by Fernando Rocha (first edition) was approached the use of minerals for therapeutic purposes, particularly clays, either for pharmaceutical purposes or in aesthetic medicine. This expert made a warning that the fact of the use of clay presents different requirements, as if intended for use in for pharmaceutical or cosmetic purposes, so it must meet certain requirements and be submitted to different technical preparation aspects. In this context, he also drew attention to the need to analyse issues relating to the legal framework applicable to the use of this mineral resource. He further explained the concept of pelotherapy, "Mudtherapy", exemplifying how "treatment through the application of a poultice made of a mixture of clay minerals and mineral water". Ana Quintela (second edition) presented the characterization of various commercial clay samples from the chemical, mineralogical, and physical point of view, highlighting their most relevant features. Alberto Galindo presented, in the second edition, some more results of the developed research (compared to the ones presented in the first edition), focusing on the regulation of the use of clays for different purposes: Therapeutic purposes, on the body; pharmaceutical and cosmetic, alerting them to the fact that the regulation of chemical requirements, such as stability, purity or chemical inertia is necessary for the use of clays for the purposes cited. He also mentioned the importance of collaboration between researchers in different fields of knowledge (mineralogists, geochemical, doctors and pharmacists) because there is a need to be for a correct mineral, textural, and physicochemical
identification and quantification of distinct components that are used in different formulations, as well as to correlate them with their biological effects. Cesar Visera presented a communication in both editions focused on the existence of a narrow line between the application of clays for therapeutic uses and for cosmetic uses, referring the closeness that exists between these uses. He called out the attention to the fact that the use of clays for these purposes must meet the same requirements as other pharmaceutical products. Fernando Almeida, together with Jorge Hamilton presented in both editions the research work developed within the framework of the doctoral project of Jorge Halmiton, being that some research results were already published in the second edition. In the study performed on the two samples of saline sludge "Santiago da Fonte" (one diluted in hyper saline water (A) and the other in freshwater (B), it was found that sample A had a high content of magnesium and sample B a low magnesium content, and currently is being performed the research to be developed in order to validate the sample A application for direct use for curative purposes and sample B, after desalination, for dermocosmetics.

Martins de Carvalho has presented in both editions the analysis of thermal activity in Portugal, highlighting the importance of therapy with thermal waters and the application of "peloides" obtained from matured clays in thermal waters. He also focused on the need for the adaptation of thermal facilities with exclusively classic thermalism to the area of SPA and thalassotherapy, with the purpose of motivating a younger audience.

He stressed the importance of bathing activities as centres for the enhancement and utilization of geothermal resources with positive effects on the energy and environment point of view, stating its contribution in reducing the greenhouse effect.
Discussion

Between the first and second editions there was an adjustment of the moments for discussion. In the first edition, the time for discussion occurred at the end of all communications, which was not found very effective due to the duration of the communications. Discussions, at the end of each session, were the choice for the second edition (Programme of the second edition), which resulted in a greater interaction, with questions being placed to the speakers, and the exchange of ideas between speakers and the audience was promoted. As an example, we can mention the question raised by the Administrator of the Alcafache Thermae, Leal Loureiro, to the scientific coordinator of the workshop, Fernando Rocha:

“What is the difference between clay and mud?”

Technical visits to the thermae

In both editions there were technical visits to the thermae in the afternoon. The programme was initiated, in both thermae, with a tour guided by the technical director in the first edition and by the administrator and the thermal director in the second one. The format was also readjusted from the first to the second edition. In the first edition, after the visit, there was a first moment with communications, with Ramiro Valentim, an orthopaedist, presenting his research and experience in treating musculoskeletal pathologies and Carla Moreira, Head of the Carla Moreira School of Hydrology and thermae and technician in the field of aesthetics and well-being, presenting treatments made with clay in the field of dermocosmetics. After this period of communications, treatment demonstrations were presented.

In the second edition, after the visit to the thermae, the two treatment demonstrations were presented with comments while they were being applied. The participating audience, which was divided in two groups, placed questions creating interactivity between the technicians and the audience.
In the two editions, the demonstrated treatments were: the application of poultice indicated for musculoskeletal pathologies, and the application of poultice for dermocosmetic treatment.

Both editions ended with Fernando Rocha, who concluded and closed the proceedings pointing out the interest of the development of joint work in the future.

**Lessons learned**

A global assessment of the two editions developed within this action allows us to state that they were conducted according to the created expectations, and that the proposed goals were achieved.

Between the first and second edition, some changes were introduced in order to overcome difficulties that were detected during the first edition. These difficulties were detected both by internal assessment and by the participants’ comments. The detected difficulties varied in nature, in particular (table 3):
### Table 3 - Analysis of workshop difficulties

<table>
<thead>
<tr>
<th>Typology of difficulties</th>
<th>1st Edition Description</th>
<th>2nd Edition Implemented solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissemination</td>
<td>Difficulty in attracting specialized audience due to agenda reasons.</td>
<td>Strong dissemination through web pages, social networks, and mailing lists of associations and interest groups.</td>
</tr>
<tr>
<td>Venue</td>
<td>Difficulty in holding the morning session in the University of Aveiro and afternoon session at the thermae. Excessive time for travel, which created excessive &quot;dead&quot; periods.</td>
<td>In the 2nd edition, the morning sessions were held at a hotel near the Alcafache Thermae, were lunch was also served, thus facilitating the access to the thermae and allowing the shortening of the afternoon session. This was a more effective solution.</td>
</tr>
<tr>
<td>Communications</td>
<td>Time for communications and presentations of results.</td>
<td>The time for communications was reduced and the presentations were more focused on result presentation.</td>
</tr>
<tr>
<td>Interactivity speakers vs audience</td>
<td>Promotion of a greater discussion between participants and speakers.</td>
<td>The workshop was organized in sessions with a period for discussion at the end of each session, which allowed a greater interactivity between participants and speakers.</td>
</tr>
</tbody>
</table>
Conclusion summary

The development of this workshop aimed to analyse clays as a resource available in saltpans that can be developed jointly with the salt production activity. The work was developed by analysing clay in an isolated form, and jointly with hyper saline water, assessing the possibility of using the product for medicinal and well-being purposes. It was intended to analyse a product, and its characteristics, to be used in musculoskeletal and dermocosmetic treatments, a product that has an associated value in a commercial point of view. The development of this workshop is a follow-up of a wider study on the potential associated to the diversity of resources existing in saltpans; as well as on how the sustainable exploitation of these resources can be compatible with the artisanal production of salt, thus contributing to reverse the growing process of decline in the salt making activity and the consequent abandonment of the saltpans, by analysing these spaces in their multi-functionality and capability of generating multiple resources.

The model of workshop, developed by the coordinating team at the University, intended to impose a new form of integration of specialists in fields like geosciences, pharmacy, hydrology, and physical therapy, in a multidisciplinary team that was aimed at the study of the said product. It was also intended the participation of an audience of specialists from several fields (medicine, physiatrics, physical therapy, geosciences, tourism), as well as the project partners in order to bring together the process of research and the scientific knowledge, and the final users expectations by integrating a component of presentation of the scientific research developed by different specialists and a technical component of demonstration of the product’s application for different pathologies.

In the development of the two editions of the workshop, it was also concluded that clays are a product that should be regulated like other pharmaceutical products; and that the research being carried out with clays from a saltpan can be the starting point for the exploitation of this resource in
an individualized manner or by joint application with hyper saline water for musculoskeletal pathologies, or desalinated for dermocosmetic use.

The exploitation of differentiate resources of the saltpans may contribute to the preservation of these important anthropogenic spaces.

Within this context, the audience had access to information regarding the product(s) and can operate as dissemination agents for information in their fields of expertise, thus creating the "multiplier" effect corresponding to the final objective of the workshop.

The audience (undifferentiated or generic) from the countries that integrate the project can also have access to the results of the workshop through the dissemination of this report and the produced documentary. They are both available at the project’s web page in the several languages of the project (PT, SP, FR, EN).