Multidisciplinary Rehabilitation and Climatotherapy at the Dead Sea

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Det Norske Rehabsiliteringssenter, Dødehavsklinikken

The Norwegian Dead Sea Rehabilitation Centre, Dødehavsklinikken, has received more than 900 patients since October 2004, the date of the first pilot group. These were all Norwegian people suffering from chronic diseases, who decided to try, often as the last chance, an intensive, individually tailored, multidisciplinary and multidimensional rehabilitation program, during 3 weeks.

Clinical experience and observational studies show an impressive short- and long-term improvement in these patients, suffering from chronic musculoskeletal diseases, including chronic pain syndrome, and fibromyalgia, chronic fatigue syndrome (CFS/ME), inflammatory joint diseases, and osteoarthritis. Skin and lung diseases were also successfully treated by this program.

The rehabilitation program follows the rules of the classical multimodal rehabilitation, and includes well-qualified (by evidence-based medicine) scientific methods. The therapeutic activities involve cognitive behavioral therapy (CBT), psychosocial activity, graded exercise therapy, sport, hydrotherapy and physiotherapy. As an integrated therapeutic modality, Dead Sea climatotherapy, including heliotherapy, balneotherapy and pelotherapy, seems to increase and strengthen the positive outcomes of the program, allowing long-term improvement of symptoms. These results are well documented, and are actually analyzed through on-going studies.

Our preliminary findings confirm the validity of existing evidence-based guidelines showing that multidimensional rehabilitation is an effective intervention for patients with musculoskeletal diseases and widespread chronic pain[1].

Climatotherapy at the Dead Sea

In the Hutchinson Encyclopedia[2] Climatotherapy is defined as "treatment of disease by living in a particular climate". This definition does not fit our knowledge, and we would like to refine it on the basis on our experience.

The terms "klima" in Greek and "clima" in Latin are well known, as are the suffixes used after them. Thus, climatology should be considered, in medicine, as the study of the climatic effects on the human body. Climatology should be seen as the basis of the Climatotherapy, which is defined as the therapeutic use of the properties of different climates or climatic factors (even if the patient is not living in this particular climate, but only receiving the treatment for a while). Climatopathology should be considered as the part of the pathology that deals with the pathogenic influences of the climate on the human body (for example seasonal affective disorders).
Numerous climatic factors are able to influence (positively or negatively) human behavior, and the evolution or the apparition of pathology. We can briefly summarize them as follow:

- The altitude and the changes of barometric pressure
- The changes in relative humidity of the air
- The changes in temperature
- The winds
- The solar radiations
- The concentration of dust, pollen and mould in the air

Among the specific climatic factors (Table A and B) the Dead Sea area, which is famous for its health-promoting environment for thousands of years, receives a unique irradiation from the sun. Moreover, an increased partial pressure of oxygen and a high density of salts in the pollen-free air are recorded in this region(3).

The Dead Sea contains unique high-density salty water with an unusual salt composition. Thermo-mineral springs are also present around the area, which is also well known for its black mud, found at the bottom of the waters. The use of these natural (non-climatic) factors should be considered as additional balneotherapy and pelotherapy in the therapeutic protocol of the patients treated at the Dead Sea(4).

The very high concentration of salts and minerals from the springs and the waters of the Dead Sea area, the medical black mud and the climatic conditions unique to the Dead Sea region - particularly the high barometric pressure, low relative humidity and high temperatures - are the main factors that make the Dead Sea area unique to cure patients suffering from a great variety of rheumatologic conditions, including inflammatory diseases and arthritis. Treatments significantly improve the condition of most patients and sometimes even bring full remission lasting a few months. Important advantages of the treatments are the lack of significant side effects. Contrary to popular misconception among some doctors and welfare specialists, contraindications from stays or treatment at the Dead Sea area are very few(4).

Table A. Climatic factors at the Dead Sea area

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
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<tr>
<td><strong>Average Max. Temp.</strong></td>
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<td><strong>Average Min. Temp.</strong></td>
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<td><strong>Average Delta Temp.</strong></td>
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<tr>
<td><strong>Mean Relative Humidity</strong></td>
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<td></td>
<td>43.5</td>
<td>48.9</td>
<td>40.9</td>
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<td>34.5</td>
<td>38.5</td>
<td>37.2</td>
<td>40.3</td>
<td>42.6</td>
<td>45.8</td>
<td>42.1</td>
<td>46.2</td>
</tr>
<tr>
<td><strong>Average Dead Sea Water Temp.</strong></td>
<td>C°</td>
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<td>33.5</td>
<td>32</td>
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</table>
Table B. Comparison of salt concentration of the Dead Sea

<table>
<thead>
<tr>
<th></th>
<th>Dead Sea water mg/L</th>
<th>Mediterranean Sea water mg/L</th>
<th>Dead Sea / Mediterranean Sea water</th>
<th>Ocean water mg/L</th>
<th>Dead Sea / Ocean water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>224,000</td>
<td>22,900</td>
<td>X 9.8</td>
<td>19,000</td>
<td>X 11.8</td>
</tr>
<tr>
<td>Magnesium</td>
<td>44,000</td>
<td>1,490</td>
<td>X 29.5</td>
<td>1,350</td>
<td>X 32.6</td>
</tr>
<tr>
<td>Sodium</td>
<td>40,100</td>
<td>12,700</td>
<td>X 3.1</td>
<td>10,500</td>
<td>X 3.8</td>
</tr>
<tr>
<td>Calcium</td>
<td>17,200</td>
<td>470</td>
<td>X 36.6</td>
<td>400</td>
<td>X 36.6</td>
</tr>
<tr>
<td>Potassium</td>
<td>7,650</td>
<td>470</td>
<td>X 16.3</td>
<td>390</td>
<td>X 19.6</td>
</tr>
<tr>
<td>Bromide</td>
<td>5,300</td>
<td>76</td>
<td>X 69.7</td>
<td>65</td>
<td>X 81.5</td>
</tr>
</tbody>
</table>

Patients treated at the Dead Sea belong to three main categories of disease, while other pathologies were treated sporadically only:

- Skin diseases: Psoriasis, Atopic Dermatitis, Vitiligo, Mycosis Fungoides and many other skin pathologies reacting to UVB artificial treatment
- Rheumatologic diseases: Arthritis and Osteoarthritis, Fibromyalgia, Chronic Pain Syndrome, Myalgic Encephalopathy or Chronic Fatigue Syndrome
- Respiratory diseases: Cystic Fibrosis, Asthma, COPD

The Research Institute at the Dead Sea on Climatotherapy for Skin Diseases - RIDS

Founded in 2006, this center associates the Department of Dermatology of the Hadassah University Hospital, Ein Kerem and the DMZ Medical Center at the Lot Spa Hotel, Ein Bokek, represented by their respective directors (Professor Arieh Ingber and Dr. Marco Harari). The projects focus on skin diseases treated at the Dead Sea, from the physiopathology to the clinical aspects. Recently, the Research Institute was greatly honored by receiving the agreement for collaboration from the head of the prestigious Department of Dermatology of the Ludwig Maximilian University, Munich, Professor Thomas Ruzicka. New studies are planned between the two countries.

The Dead Sea area also enables balneotherapy and the therapeutic use of Black Mud. In cooperation with the Department of Internal Medicine D, Soroka University Medical Center, and its head, Professor Shaul Sukenik, we also plan to investigate new aspects of balneotherapy. The last study took place at the Lot Spa Hotel, with the participation of patients suffering from arthritis, and the results have recently been published[5].

The Norwegian Clinic at the Dead Sea

The clinic was founded in 2004 in order to allow Norwegian patients suffering from chronic illnesses to undergo rehabilitation. The patients are being treated at the DMZ Medical Center, at the Lot Spa Hotel, Ein Bokek. The first pilot group included about 30 patients, from which many parameters were
studied, as final results and long-term effects of the treatment.

The Norwegian clinic has developed a unique concept. This is based on a multidisciplinary rehabilitation model associated to the intense use of climatic factors, which showed impressive and spectacular results. Thus, many groups of patients went to the Dead Sea and many chronic conditions were successfully improved. The important amount of patients, since 2004 more than 900, mainly suffering from chronic pain syndromes, calls for follow-up studies and clinical trials that should involve Norwegian physicians.

Dødehavstiftelsen - The Medical Foundation for Multidisciplinary Rehabilitative Climatotherapy, Education and Research in Chronic Diseases

The Foundation was established in 2008 in Norway as a national, non-profit, idealistic medical research institute. Dedicated to the multidisciplinary rehabilitative climatotherapy (MDRC), its goal is to improve the quality of life of people suffering from chronic diseases.

The mission of this organization established in Stavanger, is to strengthen the rehabilitation service offered to Norwegian patients suffering from chronic diseases. To ensure they receive the needed medical multidisciplinary rehabilitation through reputable, controlled and well-evaluated scientific treatment methods, in the unique healing climate at the Dead Sea.

The purpose is to:

- Assure and improve the quality of the rehabilitation program through continuous research.
- Spread the knowledge gained through scientific publications.
- Develop training program for Norwegian health-care personnel within medical multidisciplinary rehabilitative treatment.

The Foundation is operated from a comprehensive view of human life and the belief that every life has equal value. The MDRC needs a high level of multidisciplinary expertise and quality. These two conditions will provide the basis of the scientifically documented medical treatment and care. The MDRC is individually tailored to suit the individual’s complex needs, regardless of religious and political viewpoints.

The Foundation is operated in accordance with Norwegian laws and guidelines. The MDRC will adapt to the authorities’ current health requirements towards the public.

A scientific advisory board of non-compensated trustees provides community leadership and assistance to the institute’s management.

The University in Bergen has approved a scholar ship to a Norwegian physician in charge for evaluating retrospectively the results of nearly 700 Norwegian patients after multidisciplinary rehabilitation and medical climatotherapy, at the Norwegian Dead Sea Rehabilitation Center and DMZ Medical Center. Publications are to be released in 2010.

Also in the end of 2010 there will be released publications on vitamin D studies, evaluating the effect of changes in vitamin D serum levels at the Dead Sea area on rheumatic disease pain and severity.
We hope that our efforts done in collaboration with Norwegian physicians for introducing climatotherapy and multidisciplinary rehabilitation will receive more attention from the physicians and health decision makers. We believe that we are at a privileged place, at the DMZ Medical Center, receiving thousands of patients each year, from all over the world. We see this as a unique opportunity to carry out studies and develop cooperation between medical centers.

**The multidisciplinary rehabilitation program**

The rehabilitation program at the Dead Sea follows the evidence-based guidelines for therapeutic interventions.

**Introduction**

Very few rehabilitation centers are able to reach the level at which several treatment modalities are incorporated simultaneously during therapy. For example, "Comprehensive rehabilitation" in Norway includes indeed a lot of options, but lacks by the fact that it can be resumed to physical and group activities. Although social interventions take place in the treatment, they are not always considered as a tool for reaching a primary endpoint. Finally, psychological and psychiatric interventions are used only in specialized settings and rarely a part of a rehabilitation program.

Some aspects of the rehabilitation at the Dead Sea should be highlighted:

The treatment is multidisciplinary and individually tailored to suit each individual needs. Safeguard or improvement of physical and mental health, as well as successful psychosocial interventions is the main challenge of the program.

During the stay, therapists working as a team on each patient tend to improve quality of life issues by helping to find ways to cope with everyday stress, whilst addressing the challenge of living with a chronic disease.

The rehabilitation issues should always meet high quality standards and look after the patient's needs and expectations, in an overall perspective.

**The MDRC Program**

The multidisciplinary specialist team, also including psychiatrist and psychologist, makes initial evaluations of each patient and includes the patient in the decision-making, prescribing a graded therapeutic procedure. During the 3 weeks long treatment period there are program is adjusted the individual's special needs.

The term “Dead Sea Climatotherapy” includes several medically supervised treatment modalities: balneotherapy, hydrotherapy, physiotherapy, sport and physical training, and heliotherapy (sun exposure). Through these scientifically well-recognized treatment methods, the patients receive medical climatotherapy as an integral part of the custom made multidisciplinary rehabilitation program. Treatment of musculoskeletal pain syndrome at the Dead Sea is effective and safe and has become an additional therapeutic modality in fibromyalgia\(^{[4,11,13,14]}\).

Aerobic endurance training and stretching program including gradual increase and adapted to the individual performance capacity\(^{[47]}\) are programmed in supervised group exercise interventions, both outdoors and indoors\(^{[45,46]}\), including relaxation and stress coping exercises.
Intense and focused psychological interventions take naturally place in the group, which participants experience many hours together with their pairs. Regular meetings, including seminars, lectures and presentations, are programmed during the 3-week stay.

The psychological, cognitive and psychosocial interventions in the MDRC program are all included in the multi-modal cognitive behavioral treatment model.

*Comorbid psychiatric diseases and psychological distress.* Recent studies show comorbidity of depression, anxiety and personality disturbances among patients suffering from chronic pain and fibromyalgia(35,36,41). Depression and anxiety worsen the patients sensation of pain and tiredness and intensify the overall symptoms(36,37,38).

Medical and psychiatric co-morbidities as well as the nature and severity of symptom domain, together with the individual’s level of function and psychosocial stressors, are carefully taken into account when tailoring the rehabilitation program for each patient.

The multi-modal cognitive behavioral treatment model (MCBT) includes gradually adapted physical exercises, psychological interventions including cognitive and behavioral modification, psycho-educational program and psychosocial intervention and support. The psycho-educational program and CBT, involving cognitive and behavioral therapy, are given in individual therapy as well as in group settings. Groups are an important modality because of the dynamic developing between the participants. They share their experiences and soon find themselves supporting each other as a close related team, working to achieve better functioning and quality of life.

Cognitive competence training program enable strategies for coping with daily challenges of chronic afflictions, pain and stress. The behavioral therapies include relaxation, breathing and biofeedback techniques, together with mindfulness based stress reduction. The ability to self-regulate subjective states and the confidence that result from successful management through behavioral therapy proves important to the individual’s recovery.

Cognitive behavioral therapy reduces the symptoms of pain, depression and anxiety(29,30,40).

Techniques for Relaxation and stress coping also reduce the symptoms(1,27).

The program addresses the complexity of social, behavioral and psychosocial issues, helping the individual to promote positive change in life quality by achieving and strengthening coping strategies and awareness of own resources and possibilities, thereby regaining control of own life.

All these treatment modalities are included and added to the multi-modal rehabilitation program proposed to the patients in a quiet and relaxing atmosphere in an out-patient-setting-like situation.

*Final comments*

The multidisciplinary rehabilitation and medical climatotherapy at the Dead Sea for Norwegian patients suffering from chronic musculoskeletal diseases represents a unique combination of:

- ✓ A multidisciplinary team with a highly qualified, experienced and devoted personnel
- ✓ Exceptional climatic conditions within natural landscapes
- ✓ Unique “Non-hospital” treatment, during a 3-week-only starting strategy
Results on functional capacity by individual and group exercise program are controlled by improvement of endurance, strength, and mobility and the use of relaxation techniques. In group-based education and training, this improvement is obtained using:

- Body structure therapies
- Diet
- Exercise planning
- Coping strategies
- Communication
- Strategies for conflict negotiations
- Social security system

Indoor and outdoor activities include Dead Sea pool, Nordic walking, aqua gym, swimming, and bicycling and fitness room. Indoor & outdoor specific Dead Sea activities include:

- Dead Sea baths
- Black Mud applications and wraps
- Sulfur Pool
- Controlled sun exposure
- Medical massages and manipulations
- Desert walks

The improvement of emotional distress in individual and group activities is reached through the “Group and Tourist effect”, trips around the Dead Sea, daily contacts and social activities as well as specialized meetings. During the stay, improved coping skill levels in each individual are easily reached through:

- Psychiatric intervention
- Mutual psychological encouragement
- Close follow up during the 3-week period
- Drug management
- Possible changes in treatment strategy

Conclusion

The 3-week long multidimensional rehabilitation program at the Dead Sea, is a full-time behavioral medicine program in a cognitive setting. It is a cost-effective method for improving health and increasing return to work statistics.

The MDRC at the Dead Sea fit the needs of a true MDR program, whilst introducing a new vision of MDR in the unique climate at the Dead Sea. After a 7 year experience and 900 treatments with encouraging results, this therapeutic option should be evaluated further by long-term studies in cooperation with Norwegian Institutions.
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Appendix 1 – Physical Global Assessment of Disease Severity (sleep, function and pain scores)

19 Norwegian Groups, n = 452

PGADS – Average Values

Arrival

Departure

61.9

27.2
Appendix 2 – Improvement of Ergometry Tests at the Dead Sea

19 Norwegian Groups, $n = 452$

![Graph showing average values in meters at arrival and departure.](image)
What are the benefits of the Dead Sea Water and Salts?
Marco Harari, MD

The high mineral content of the Dead Sea has been considered a major factor in treating a variety of diseases. The sea contains about 320 g/L salt, and, compared to the ocean, is richer in its proportions of calcium, magnesium, potassium and bromide. Although lower in its proportions of sodium, sulphate and carbonate(1). It has been reported that repeated bathing in the Dead Sea for a certain length of time has a therapeutic effect on some skin diseases(2), and penetration of Dead Sea minerals through human and guinea-pig skin through bathing in this hypertonic salt solution has been demonstrated and quantified(3).

Two major effects are well recognized during seawater immersion, and they are largely used in numerous Thalassotherapy Centers all around the world (more in France). Of course, these effects are concomitant to the other advantages of simple water immersion – known and used especially for skin care, orthopedic care, rehabilitation purposes and relaxation. Physical characteristics of the water, as its temperature for example, (but also the ambient conditions during the bath), may also play an additional role in these effects.

These two effects are: absorption of elements and minerals and increased range of joint motility.

1. Studies show that there is absorption of ions through the skin barrier during immersion in seawater. Of course, this absorption depends of the presence and the concentration of these ions and trace elements, as well as the long-term effects of this phenomenon.

2. There is an increased capacity of movements for the muscles during seawater immersion. A muscle presenting a decreased strength resulting in the incapacity to move a segment can be able to do it, in the water. Moreover, the whole body weight is decreased by a factor 2.5 during seawater immersion.

The Dead Sea is not really a sea, and some authors argue that bathing in its waters is not Thalassotherapy, but Balneotherapy, use of water and salts for therapeutic purpose. However, at the Dead Sea, water immersion represents a unique therapeutic factor, because it involves these two features increased by 10 fold, feature not found in another place in the world.

There are very few publications about the beneficial effects of the Dead Sea water use for healthy people, even if the Spas at the Dead Sea are truly plenty of visitors.... In fact, the physical effects of seawater immersion were widely studied on patients suffering mostly from skin diseases (Psoriasis, Atopic Dermatitis and Vitiligo) and joints diseases (Arthritis and other conditions).

1. Dead Sea water and salts for rheumatic diseases
In many studies carried out at the Dead Sea, Professor S. Sukenik, Head of the Rheumatology Unit at the Soroka University Hospital, Beer Sheva, demonstrated with his colleagues during the past fifteen years the positive effects of Dead Sea Treatment on patients suffering from joints diseases: Osteoarthritis, Rheumatoid Arthritis, Psoriatic Arthritis, Fibromyalgia, and other rheumatologic conditions. His publications are the basis of the medical treatment protocol of these diseases at the Dead Sea, including daily seawater bath, swimming pool bath, sulfuric water pool bath, black mud envelopments and applications, physiotherapy and relaxation exercises(4,5,6).

More recently Prof. D. Flusser carried out a prospective trial involving 58 patients with knee osteoarthritis randomized to treatment with natural mud compresses or with mineral-depleted mud
compresses, five times weekly for three weeks. The natural mud compresses were rich in magnesium, sodium, calcium, potassium, chloride and total salinity. The positive results suggest that treatment with mud compresses, but only in their natural form, temporarily relieve pain in patients with osteoarthritis of the knees, through an absorption mechanism of the minerals, and not simply from the sustained heat(7).

2. Dead Sea water and salts for skin diseases
Skin diseases are the most important illnesses one encountered at the Dead Sea. The climatic factors involved in their treatment are many, and include mostly sun exposure. However the effects of the salts seem to be also important.

Synchronous application of narrowband ultraviolet B phototherapy (TL-01) and bathing in Dead Sea solution has been shown to bring better results than phototherapy alone for psoriatic patients: 71% versus 61% improvement for a cumulative irradiation dose of 17.7 versus 16.2 J/sqcm(8).

Moreover, magnesium ions (the most abundant ion present in the Dead Sea brine) have been shown to specifically contribute to the efficacy of Dead Sea water in the treatment of inflammatory skin diseases (9).

Recently, the beneficial effect on psoriatic patients was tested in order to evaluate the possible role of trace elements in the effectiveness of balneotherapy with Dead Sea bath salt. This treatment modality resulted in a significant decrease in the mean serum levels of manganese and lithium in psoriatic “responders” to treatment (with significant improvement of the skin status) and an increase of serum level of lithium in non-responders to therapy(10).

In Atopic Dermatitis a retrospective study published in 2000 showed that Dead Sea Climatotherapy, including sun and water exposure, is a highly effective treatment modality (11). Safety and efficacy of synchronous balneophototherapy using again narrowband ultraviolet B and Dead Sea salts solution was tested and proven later on for Atopic Dermatitis, and again with better results. The SCORAD decreased up to 55% versus 41%(12).

Finally, in Vitiligo patients, it has been demonstrated a pseudocatalase activity after 15 minutes of Dead Sea bathing, resulting in a re-pigmentation of the skin lesions without pigmentation(13).

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