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The Dead Sea

The World's Ultimate Natural Healing Resort for Diseases
of the Skin, Joints, Lungs and Heart, Among Others

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The Dead Sea as a Health Resort

The Dead Sea is part of the Syro-African rift that stretches from the Taurus Mountains of Turkey to the Zimbazi Valley in South Africa, a distance of 6,000 kilometers. The Dead Sea is about 67 kilometers (41 miles) long and 18 kilometers (11 miles) at its maximum width and is the lowest spot on earth – 418 meters (1,371 ft) below sea level at its lowest point. The Dead Sea currently defines the border between Israel and the Kingdom of Jordan. The shores of the Dead Sea border the Judean Mountains on the west and the mountains of Edom on the east. According to geological theories, the sea was formed about two million years ago by the upheaval of earth between the Mediterranean Sea and the Syro-African Rift that caused a retreat of the Mediterranean waters that up to then covered the entire region.

The Dead Sea is divided into two parts, or basins: the northern basin, which is the larger and deeper of the two with a maximum depth of 400 meters (1,312 ft), and the southern basin, which is much smaller and very shallow – only a few meters in depth. In the past, the two basins were separated by a tongue of sea called Al-Lisan (“tongue” in Arabic). Today the two parts are separated by a narrow channel, which was dug to prevent the southern basin (which contains the Dead Sea evaporation pools) from drying out and disappearing.

The Dead Sea, which has no outlet, gets most of its water

from the Jordan River as well as from small streams that bring it relatively small amounts of sweet water. In the winter season it also receives a certain amount of precipitation that runs off the surrounding mountains.

The hot climate that prevails in the region causes evaporation of large quantities of water from the Dead Sea. In addition, diversion of water from the Jordan River by both Israel and Jordan for irrigation and drinking water has resulted in the “shrinking” of the Dead Sea. For example, in the past thirty years, the level of the Dead Sea has dropped by over 25 meters (82 ft) at a rate of 0.8 meters (2.62 ft) a year. Because the amount of water entering the Dead Sea is smaller than that evaporating from it, some see a danger that in the not very distant future it will dry out and disappear. Other scientists believe that the Dead Sea will not dry out entirely, since when the water level drops by another 100 meters (328 ft), a new balance will be established between the sources of water in the region, which will prevent its disappearance.

In the course of time, changes in the formation of the earth created underground streams. Large underground burrows remained in places where small rivers that once flowed into the Dead Sea ceased to exist. These burrows can collapse suddenly, without warning, creating deep pits known as sink holes that endanger the lives of residents and tourists in the region.

Minerals of the Dead Sea and Regional Springs

The Dead Sea is saltier than all other lakes, seas and oceans in the world, meaning that it contains a greater amount of dissolved salts than any other body of water on the earth. The amount of dissolved salt per liter ranges from 31.5 to 34.0 grams, an amount that is approximately ten times greater than that of the Mediterranean Sea (see Table 1). The waters are especially rich in

magnesium, phosphates, sodium, chlorine and bromides (bromine compounds) and many other trace elements. In contrast, regular seawater contains cooking salt (mostly NaCl, which constitutes 95% of its salt), while Dead Sea water contains only 12%-15% sodium of its total mineral content. The salinity of Dead Sea water is even greater than that of the Great Salt Lake in the state of Utah, USA. The high concentration of salts, which gives the water a high specific gravity, enables people to float on the water's surface without fear of drowning. At the same time, swallowing a small amount of Dead Sea water may cause complications, a phenomenon that will be discussed in the chapter on adverse effects of balneotherapy.

Nuns living in the area named the sea the "Dead Sea," because they believed that because of its high degree of salinity no creature could live in it. This assumption has proved to be mistaken. In 1936, a young Israeli researcher named Eliezer Volcani published an article in one of the world's most prestigious scientific journals that contained the results of his study, according to which a number of unicellular creatures (bacteria) have developed unique mechanisms allowing them to live in the Dead Sea. In recognition of his discovery, one of the bacteria discovered in the Dead Sea was named after him – *Halopherax volcani*. Several years ago, Ukrainian researchers found that besides the unicellular bacteria discovered by the Israeli scientist at least three types of fungi live in the Dead Sea. It is interesting to note that researchers have been successful in breeding these fungi in regular laboratory cultures only when water containing a 50% concentration of Dead Sea water is added to the substrate. That is, not only do the fungi grow in salt water, but they need the high salt concentration to continue developing.

Mineral water emanates from more than a dozen underground springs near the Dead Sea. The temperature of the water in these springs ranges from 28° to 30°C (82.4° to 86.0°F). The most

famous of these springs are called Hamei Zohar, Hamei Mazor, Hamei Shalem, Maayonot Ein Gedi, Hamei Yesha, Hamei Ein Tamar, Hamei Ein Hakikar and Hamei Ein No'it. They are sometimes referred to as sulfur springs, because they contain different compounds of sulfur that give them an unpleasant smell similar to that of rotten eggs. But the name is not justified, because it is not yet known precisely which components have the most beneficial effect on patients' symptoms. The amount of minerals dissolved in the waters of these springs is much less than that of the Dead Sea, but still much more than that of all other health springs in the world (see Table 2).

Trace Elements

In addition to its primary minerals, the waters of the Dead Sea and the hot springs also contain miniscule quantities of many other substances known as trace elements. They are of great importance because a deficiency of one or more of these substances can affect the proper functioning of the immune system. For example, we know that patients suffering from rheumatoid arthritis often have a deficiency in zinc and some researchers have reported that the oral administration of zinc results in a degree of improvement in the condition of some patients. Another example is a surplus of copper, also considered a trace element, which may cause deterioration in the condition of patients suffering from rheumatoid arthritis, so that drugs that reduce blood copper levels can improve their condition. As mentioned above, trace elements are found in different concentrations in Dead Sea water and in the water of the surrounding springs (see Table 3).

Medicinal Mud

Medicinal mud used for therapy at the Dead Sea health resort is mined at specific sites along the shore of the sea. For the most part, it is black in color and is called “black mud.” This mud contains two principal components: organic and inorganic. The inorganic components are the various salts in the mud that are related to its various earth components. The organic component contains the remains of living organisms, seaweed and various plants. In the Dead Sea region only the kind of material known as “mud” is used. This kind of mud is comprised mostly of inorganic materials – high concentrations of various salts and minerals, including important trace elements (see Table 4).

One of the characteristics of the mud used at the Dead Sea is its ability to preserve its heat for a long time after it has been applied to the body – its temperature decreases at a rate of one degree centigrade every ten minutes. In addition to this effect – beneficial in itself – of the heat on surrounding joints and tissues such as tendons, ligaments and muscles, the mud increases the secretion of different chemical compounds that suppress the inflammatory process, and reduces or blocks the secretion of other compounds that accelerate it. The mud also increases the secretion of antioxidants whose function is to protect the various tissues from the free oxygen radicals produced in metabolic processes that tend to cause oxygenation, which can cause tissue damage. The role of the antioxidants, including vitamin C, vitamin A, vitamin E, selenium, and others, is to prevent the oxygenation of these radicals. Studies conducted, especially in Italy, have shown that mud packs can increase the secretion of antioxidants and thereby improve the condition of patients suffering from arthritis, a disease sometimes characterized by increased secretion of free radicals. It is worth noting that recent studies have shown that Dead Sea mud also has properties that inhibit the development of various

bacteria. The addition of Dead Sea mud to bacterial cultures such as *E. Coli*, *Staphylococcus aureus* and others suppresses their growth.

Table 1. The composition of Dead Sea water in comparison to Mediterranean Sea and ocean water. The values are in milligrams per liter.

Element	Dead Sea	Mediterranean	Ocean
Chloride	224,900	22,900	19,000
Magnesium	44,000	1,490	1,350
Sodium	40,100	12,700	10,500
Calcium	17,200	470	400
Potassium	7,650	476	390
Bromide	5,300	76	65

Table 2. Water composition of a mineral spring (Hamei Zohar). The values are in milligrams per liter.

Element	Composition
Chloride	35,509.5
Bromide	769.5
Bicarbonate	185.5
Sulphate	677.5
Lithium	3.66
Sodium	8,595.0
Potassium	825.0
Calcium	3,600.0
Magnesium	5,830.0
Stronthium	52.5

Table 3. Trace elements in the water of the Ein Gedi spring. The values are in micrograms per liter.

Element	Concentration
Arsenic (As)	1.0
Cadmium (Cd)	0.1
Chrome (Cr)	10.0
Copper (Cu)	59.0
Mercury (Hg)	0.1
Selenium (Sc)	1.0
Lead (Pb)	11.0
Zinc (zn)	45.0
Cobalt (Co)	23.0
Nickel (Ni)	27.0
Molibdenum (mo)	10.0
Vanadium (va)	100.0
Silver (Ag)	1.0

Table 4: The main elements of Dead Sea mud. The values are in milligrams per liter.

Element	Concentration
Mg	32,503
Na	31,734
Ca	23,547
K	6,835
Cl	190,000
Total Salinity	2,784,625

The Medical History of the Dead Sea

The Dead Sea is referred to by many names. It is also called the

East Sea, the Arava Sea, Lot's Sea, the Zohar Sea, the Sodom Sea, the Gomorrah Sea and the Salt Sea, among others. The Greeks called it the "Asphalt Sea" because of the material that looked like asphalt that was drawn from its waters and served many purposes, medicinal and non-medicinal. It is assumed that the biblical cities of Sodom and Gomorrah were situated on the south coast of the sea. The nearby city of Jericho is considered to be the oldest city in the world (Kings II, Chapter 2, verses 19-23). We read of the prophet Elisha who added salt to the water of a spring near Jericho to purify it, thereby ending the epidemic which killed many residents of the area who used this water for drinking and to irrigate their fields and water their flocks of sheep.

The Egyptian Queen Cleopatra, who lived in the first century BCE and was thought to be one of the most beautiful women of her time, was known for her great love of beauty and health products. She believed that the waters of the Dead Sea contained substances that were beneficial to health and established industries in the area for the production of perfumes and beauty care products. Various compounds, essences and ointments were produced or compounded from the waters of the Dead Sea together with plants that grew along its shores and in the area of Jericho. Of these, the most important was the balsam tree, a member of the pine family, whose branches, trunk, leaves and seeds were used to make products for beauty care and an ointment to treat sores. In Europe, where widespread use was made of the ointment, it was called Jerusalem Balsam. Medicines derived from this tree also were used in the treatment of headaches and visual impairments of various types, including impaired vision due to cataracts. Material produced from this tree was also used to improve the taste of wine. Local residents, who earned their living in this endeavor, kept the secret of the processes used for production of the medicine and perfume made from the balsam tree.

The Nabateans living in the region used to sell the Egyptians a

black material known as bitumen (similar to black tar) that they extracted from the seawaters. The Egyptians used bitumen for body stuffing and mummification. The bitumen was also used for calking and sealing boats and was called Jews' tar. It was also used as a medicinal substance to prevent muscular spasms (of the abdominal muscles, for example), to heal wounds, to mend broken bones and stop bleeding from skin wounds. Gladiators who fought in the arena frequently used bitumen ointment to stop bleeding and hasten the healing of their wounds, and Muslim doctors used it as a medicine for the treatment of infections caused by worms. King Herod, who built the famous winter palace at Massada, also built therapeutic and pleasure pools for the use of the soldiers of the Roman legions. Josephus Flavius mentions the waters of these hot springs and notes that it is even possible to drink the water for therapeutic purposes. When Herod became ill, his doctors recommended bathing in the spring waters, a treatment that in the end didn't prevent his death, apparently from end stage kidney failure. The rich residents of Rome used to import by sea large containers of Dead Sea water for bathing at home in luxurious baths. As is well known, ancient scrolls of great scientific and historical value were discovered in the Dead Sea region, but to our great surprise, there is almost no reference in them to the therapeutic properties of the region.

In the Byzantine period, several monasteries were built in the area and many Crusaders made pilgrimage to them. Bedouin tribes have also lived in the area for hundreds of years, but we have no information about use made by the Bedouin or the Crusaders of the therapeutic products of the Dead Sea, or of their bathing in its waters for therapeutic purposes.

In 1772, the French scientist Lavoisier (whom most of us remember from our chemistry lessons at school) published the first analysis of the composition of Dead Sea water, and in 1889 the famous French scientist, Joseph Louis Gay-Lussac, published a further analysis of its composition.

The visionary founder of the Jewish State, Benjamin Ze'ev Herzl, mentioned, in his speeches as far back as 1902, that the waters of the Dead Sea are rich in bromine, sulfur and phosphates that can be produced, used and even traded commercially. In 1911, the Russian Jewish mining engineer, Moshe Novomeysky, who later immigrated to Israel, visited the country and was highly impressed by the enormous commercial potential in the production of different minerals from the Dead Sea. In 1920, he applied to the British Mandate authorities for a franchise to produce these minerals. In 1930, Israel Potash Industry, Ltd., was established and in 1932 it began the production of potash.

The first plant to be built was situated in the northern area of the sea, around Kalia. Jews and Arabs worked together in the plant and produced potassium and potassium salts. My father, blessed is his memory, Dr. Shmuel Sukenik, to whose memory this book is dedicated, worked for two years in this plant as its only doctor, treating both Jewish and Arab workers with dedication. A second plant was built later, in 1934, in the southern region, near Sodom, and this is the plant now known as the Dead Sea Industries, which is the fourth largest plant in the world for production of potash. Other important materials, required by various industries, are produced from the waters of the Dead Sea including magnesium chloride, aluminum chloride, industrial salts, antifreeze, cooking salt and raw materials for the cosmetics industry.

Following the creation of the State of Israel, scientists and physicians from all over the world began to show interest in the unique healing properties of Dead Sea water and since then have written and published hundreds of studies proving the importance of the region as a unique therapeutic site.

The Unique Climatic Conditions at the Dead Sea

According to the well-known author, Mark Twain, “Everybody complains about the weather, but nobody does anything about it.” The weather in the Dead Sea region is far from being pleasant for those who live there, but it has unique qualities that alleviate the suffering of patients with a wide variety of illnesses, including joint disease, skin disease, heart disease and lung disease, among others. In this chapter we will describe and explain the unique climatic conditions of the region and the effect they have on various illnesses.

Ultraviolet Rays

Ultraviolet rays are invisible to the human eye. There are two kinds of ultraviolet rays, distinguished one from the other by their wavelength: UVA, whose wavelength is between 320 and 400 nanometers, and UVB, whose wavelength is between 280 and 320 nanometers. UVB rays, which cause sunburn, are more harmful to humans. As a result of the high temperatures characteristic of the region on most days of the year and the paucity of clouds that block the sun’s rays, the Dead Sea region is characterized by evaporation of large quantities of water from the sea surface, which creates a vapor haze. This haze blocks the UVB rays (the harmful rays) more than it blocks UVA (the good rays). The fact that the Dead Sea is the lowest spot on earth – 400 meters (1,312 ft) or more below sea level – increases the distance traveled by the ultraviolet rays before they reach land, UVB more than UVA rays. The ratio between UVB and UVA, therefore, is the highest anywhere on the face of the earth. In fact, this difference in the nature of ultraviolet radiation between this region and all other regions makes it beneficial in the healing of several skin diseases,

including psoriasis. The unique radiation in the region also reduces the risk of sunburn due to exposure to the sun and allows patients to remain in the sun for longer periods of time than they could do in other places.

Atmospheric and Barometric Pressure

Atmospheric pressure is the force exerted by the weight of air in the earth's atmosphere. Atmospheric pressure is measured in units called "atmospheres." One atmosphere is the pressure exerted by a column of air at sea level. Heat and cold affect the weight of air and thus the atmospheric pressure, but their effect is small and insignificant. The atmospheric pressure at the Dead Sea, which is the highest in the world, has a beneficial effect on a broad range of diseases, particularly on joint diseases, chronic lung diseases, heart diseases and others.

Atmospheric pressure is measured with a barometer, which is a tube filled with mercury, closed at its upper end and immersed in a bowl of mercury that is open to the air (similar to the instrument used for measuring blood pressure, which is also based on a column of mercury). The pressure of one atmosphere at sea level at 0°C (32°F) is equal to a mercury column 760 millimeters high. In fact, "barometric pressure" and "atmospheric pressure" are interchangeable terms. Atmospheric pressure, for example, decreases by 50% for every ascent of 5.5 kilometers (3.42 miles). The lower the point below sea level, the greater the barometric pressure, so that in the Dead Sea region it is the highest in the world – about 800 millimeters of mercury.

Studies conducted in the United States in the 1960s proved that an increase in barometric pressure usually results in alleviation of joint pains. When an American millionaire heard the report of studies conducted with his funding, he replied in surprise: "That's

it? – you could have gotten all of that information about the effect of weather from my wife, without needing studies like these.” And in fact it is well known that arthritis patients can occasionally serve as weather forecasters, predicting oncoming rain. The explanation for this is simple: before the onset of rain, there is a decrease in atmospheric pressure, called a barometric depression. This depression causes an increase or reappearance of pain, so that the patients know that rain is on the way.

Humidity and Relative Humidity

“Humidity” is the degree of moisture in the air. It can be measured in terms of absolute humidity or relative humidity: “Absolute humidity” is the mass of water found in a specific mass of air; “relative humidity” is the ratio, expressed in percentage, between the quantity of vapor (water) in the air (at a given volume and temperature) and the amount of vapor that the same volume of that air can contain when it is fully saturated. The maximum quantity of vapor the air can contain depends on its temperature. The higher the temperature, the greater the amount of water vapor it can hold, and the lower the temperature, the less it can hold. The explanation for this lies in the fact that relative humidity is derived from the balance between the rate of evaporation and the rate of condensation (the creation of water vapor) of the water molecules. The lower the temperature is the greater is the condensation relative to evaporation.

As a result, in addition to barometric pressure, humidity and temperature play a significant role through their effect on the symptoms of patients suffering from joint diseases. As long ago as 1948, Swedish investigators built special hospital rooms in which the temperature and humidity could be controlled. They housed patients suffering from various types of joint diseases in these rooms for approximately 100 days and proved that at high

temperatures – about 32°C – (89.6°F) and relatively low humidity (about 35%), most of the patients experienced improvement in their condition. For the most part, relatively low humidity brings relief of joint pain. At the Dead Sea the humidity is relatively low: approximately 33% from April to September and 40-50% during the rest of the year. The uniform high temperature, which in the summer months ranges from 32°C to 40°C (89.6°F to 104°F) and during the winter months ranges between 20°C and 24°C (68°F to 75.2°F), also reduces joint pain.

The season of the year also affects symptoms. Sometimes we see worsening in a patient's condition during the winter months, which is almost certainly a result of the decreased barometric pressure and increased humidity. In the summer, on the other hand, most patients experience relief.

In studies conducted in Israel in the 1990s by Prof. Abraham Weinberger and his team, it was found that joint pains were affected by barometric pressure, temperature, and humidity. It was also found that women are more sensitive than men to changes in the weather. It is interesting to note that even after knee replacement surgery, in which the patient's knee is replaced by an artificial one, weather continues to affect pain symptoms in the implant. Various studies have shown that a paucity of precipitation is beneficial for joint pains so that this factor, which is also characteristic of the Dead Sea region, is of some importance.

Oxygen-enriched Air

As is well known, the saturation of oxygen in air decreases as we ascend to higher altitudes (above sea level). The opposite is also true: the lower we descend below sea level, the “richer” the air becomes in oxygen, in addition to barometric (atmospheric) pressure. Because of this difference in barometric pressure, the

amount of oxygen inhaled into the lungs is significantly greater at the Dead Sea than anywhere else. The high level of oxygen contained by the air there has a beneficial effect on patients suffering from chronic lung and heart diseases.

Low Level of Allergens (Substances That Cause Allergies) in the Air

It has long been known that the number of people suffering from asthma increases in places rich in vegetation, where pollen from trees, plants and flowers is found in high concentrations in the air. The relatively small number of plants and trees in the Dead Sea region reduces the amount of allergens carried by wind that could result in an increased severity of asthma attacks, or even cause them. It should be noted that the small number of industries located in the region also reduces air pollution and the emission of toxic substances that have a harmful effect on asthma patients.

The concentration of bromine in the air

Because of the high level of evaporation of water from the Dead Sea that contains a high concentration of bromine salts, the amount of bromine in the air is approximately twenty times greater than in other places. When we inhale Dead Sea air over a period of several weeks, the amount of bromine in our blood also rises significantly. Not very long ago, bromine was used in the production of tranquilizers, and before the appearance of Valium most tranquilizers contained bromine salts. The soothing effects of bromine salts explains the feeling of peace and calm experienced by many people who stay in the Dead Sea region, so that we may consider bromine to be the region's quality version of Valium.



Sulfur pool therapy