

GEOTHERMAL SPAS IN THE CZECH REPUBLIC AND SLOVAKIA

John W. Lund
Geo-Heat Center

Over 2,000 mineral and thermal springs have been identified in the former Czechoslovakia. These waters vary in chemical composition and are being used in spa resorts and for bottling. The use of the thermal waters have been traced back before the occupation of the romans, and have a recorded use for almost 1,000 years. Today, there are 60 spa resorts in the two countries, visited by 460,000 patients annually (for an average of three weeks each). About 360 million bottles of mineral water are produced in 22 bottling plants annually. Small amounts of geothermal energy are used in agriculture and for space heating. There is no geothermal power generation due to the low temperature of the resource.

SPA RESORTS



Figure 1. Major spa locations in the Czech Republic and Slovakia.

Czechoslovakia spas have old and well-established therapeutic traditions. Depending upon the chemical composition of the mineral waters and spring gas, availability of peat and sulfurous mud, and climatic conditions, each sanatorium is designated for the treatment of specific diseases. For example, in Slovakia, at Piešťany, a special laboratory does all the analysis of water and mud for spas in the region. They make recommendations as to its use, and also perform international work.

The therapeutic successes of these spas are based on centuries of healing traditions, systematically supplemented by the latest discoveries of modern medical science. Most sanatoriums require the referral of a medical doctor (both for domestic and international patients). There are special schools to train doctors in the treatment of patients at spas; five schools in Bohemia for the basic courses, and advanced courses in Prague and Bratislava (65% of the graduates are women).

Two the leading spas are discussed in detail.

PIESTANY SPA



Piešťany, located 84 km northeast of Bratislava, is the leading Slovak spa for the treatment of locomotoric system diseases. As many as 40,000 patients yearly, come here to seek relief from rheumatic pains. At present, the spa can treat 3,000 patients per day, with plans to increase the capacity to 5,000 per day.

The use of the hot springs and sulphurous muds for the treatment of rheumatic persons has a very old tradition at Piešťany. Archeological finds date settlements in the area to 80,000 years before present, giving rise to the assumption that these healing waters have been used for therapeutic purposes by Neanderthal and Homo sapiens, including Celtic, Germanic and Old Slav civilizations. The settlement was first mentioned in documents in the year 1113, the spa mentioned in 1412, and the first authentic record about its unique effect, found in a letter written in 1546, when it was part of the Hungarian empire. It has attracted many prominent persons of medical science, including the personal physician to three emperors of the Holy Roman Empire—Ferdinand I, Maximillian II, and Rudolph II, and the personal physician to Pope Sixtus V (1571). Many prominent noblemen, maharajahs, sheiks, politicians and crowned heads have been guests at Piešťany—including Ludwig van Beethoven and Napoleon who is supposed to have ridden his horse into one of the pools (now call the Napoleon Baths). Bulgarian Czar Ferdinand I used the Thermia Palace as his general headquarters in 1917, where he met with Austro-Hungarian Kaiser Karl I and German Kaiser Wilhelm II to discuss war strategy for WWI. Recent guests include the Indian maharajahs of Bhopal and Hyderabad, and several Arabian sheiks, as well as the wives of the leaders of Austria and Finland.

Initially, visitors bathed in uncovered bathing pits dug along the banks of the river Vah, which were covered by straw mats or tree branches. The first wooden building housing tub baths was built in 1778. Frequent flooding of the river required constant rebuilding of the facilities. Around 1813, accommodations were also constructed on the site, and the spa town improved in 1821. About the same time, Dr. Franz Ernst Schere changed the balneologic treatment procedures based on the latest medical knowledge, and many of his procedures are still followed today. The luxurious spa hotel Thermia Palace and the balneotherapeutic center Irma were completed in 1912, resulting in the spa becoming the meeting place of Europe's elite (as part of the Austrian-Hungarian empire). The spa was privately owned up to 1940, at which time it became the property of the state (Czechoslovakia State Spa and Curative Springs in the Slovak Republic). Fortunately, the spa itself has resisted commercial exploitation, thanks in part to one of its inspectors, engineer Peter Krahulec.

Spa treatment is based on the hot gypsum-sulphuric springs (67 - 69°C) containing 1,500 mg/l TDS, as well as gasses, especially hydrogen sulphide, and sulphuric mud. Thermal water is used in pools and tubs, and the mud is utilized in baths and for mud packs. Hydrotherapy, electrotherapy, rehabilitation and remedial exercises, underwater massage, massage, medications and medial diet are all components of the complex treatment system. Piestany is the seat of the Research Institute of Rheumatic Diseases, founded in 1952 to study the complex immunological processes in the diseases of the locomotor system.

The resources originates at 2,000 m depth and surface springs flow at a rate of over three million liters per day. The spring water is cooled from around 69°C to 35-40°C for use in pools and baths. The chemical composition of the water is: 60.4 mg/l SO₄, 59.6 mg/l Ca, 21.2 mg/l HCO₃, 20.3 mg/l Na, 17.5 mg/l Mg, 17.2 mg/l Cl, and 151 mg/l CO₂. The sulphurous mud is cured six months in an outside storage vault by an anaerobic process to increase the sulphur content. It is also "cooked" for a minimum of 48 hours from 70 to 80°C for the peloids (clay particles) to gain their optimum properties before use.

There are two types of pools: some have a natural bottom with a layer of curative mud through which thermal waters (cooled to 40-41°C) flow. The other type of pool together with the tubs are supplied with thermal water (38-40°C) through a system of pipelines. The sulphur mud is applied in forms of hot compresses by means of modern equipment (spray-gun) or as partial packs on hands and legs in simple wooden vessels at a temperature around 50°C.

KARLSBAD SPA (KARLOVY VARY)

Karlsbad, located 142 km west of Prague near the German border, was founded in the 14th century (1338) by the Bohemian King and Roman Emperor Charles IV (Karl IV), who also bestowed his name on the town. The town is hidden in the valley of the Tepla River, which is framed by wooded hills and precipitous cliffs, such that the town is mostly only one block wide on either side of the river. Geologists believed



that springs, between 35 and 72°C, have flowed for about fifteen million years, and has been used for healing purposes for more than 600 years. There are a total of 132 springs that have been identified, with 12 main ones, producing a total of 2,000 l/min. Tradition says that the "thirteenth spring" is a local alcoholic drink, a herbal liqueur developed in 1807, called *Karlovarska Becherovka*.

The river valley is formed by granitic tectonic blocks which created a rift valley. Subsequent basalt lava flows and aragonite mineralization are also present. The recharge area of the karlsbad thermal water is located in upper granite blocks on both sides of the rift valley. Rainwater flows through fissures down to a depth of more than 1,000 m, where the temperature is more than 100°C (Laboutka and Vylita). Heated water in the accumulation area is saturated with ascending juvenile CO₂ and water vapor. A large aragonite mantel has developed around the thermal springs, caused by the dissolution of CO₂.

The spa is far more commercially developed than Piestany. The original castle, built by Charles IV in the 14th century, was rebuilt in 1608, and a market was constructed in 1883. A Colonnade was constructed in 1911, containing four wells 50 to 90 m deep producing 72°C water (cooled to 30°C). Water from these wells are drunk through the handle of special cups, carried by visitors. This facility also contains a geyser ("Vridlo" or Boiling Source), high in CO₂ (volume ratio of 1:3-hot water to gas) and discharging 100 l/min., with a maximum head of 15 m (it is restricted to 10 m due to the height of an enclosed structure)(Paces, 1988). In addition, a total of 180 tons of mineral salts are produced annually, which are exported for their curative properties. This process has been carried out for 300 years. An estimated 5,000 l/min. Of CO₂ is produced from the entire field, a portion of which is extracted for commercial use. The aragonite and calcite deposits are colored by traces of iron. The chemical sediment is called "Vridlovec," and is used to manufacture jewelry. Small items immersed in the mineral water are soon coated with "Vridlovec" and then sold as souvenirs.

This famous resort where “the devil sprays hot water on the world through a hole in the earth,” has been visited by many famous persons. These include Beethoven, Grieg, J. S. Bach (where he was inspired to compose the Brandenburg Concertos), Dumas, Chopin, Brahms, Liszt, Schumann, Wagner, Tchaikovsky, Paganini, Peter the Great, Bismark, Maria Theresa, Goethe, and Queen Elizabeth I of England.

Today, the town of 60,000 population, has about one million visitors and treats 80,000 patients per year. The geothermal water consists mainly of Na, HCO₃, SO₄, and Cl, with a TDS of 6.45 g/l. Research by balneologists have shown that the greatest success with these waters is achieved in the treatment of chronic illnesses of the digestive system (intestinal and stomach), and a number of metabolic troubles. Long-term results are achieved particularly in cases of illnesses of the bile ducts and liver. Good results have also been achieved in the treatment of diabetes. The water cure significantly reduces the cholesterol level in the blood, making the prophylactic treatment of vascular and cardiac illnesses possible too. Treatment takes place at Spa V (the former Elizabeth Baths), and the Thermal Spa Sanatorium (capacity of 553 beds) which includes a large open-air swimming pool filled with mineral water (capacity 52 persons).

Leakage of thermal springs into the Tepla River bed through the aragonite beds, have affected the flows of the springs used for curative purposes. As a result, a program to seal the river bed was started in 1935. A clay-cement mixture is used to seal the bottom and any new excavation in the city is not allowed below 367 m elevation. New wells have been drilled to provide alternate supplies of curative drinking water; however, balneologists are concerned that this may change some of the chemical properties of the original hot springs. The water is being monitored for any possible changes.



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