Lake Aggteleki is a notable natural value of the karst territory

Microbiological surveys in Baradla Cave

An important element in the process of reaching the status of a therapeutic cave was the (lack of) interconnection of the surface sinkholes with the respective floors of the cave, since a significant part of the surface catchment area of the Baradla–Domica cave system consists of cultivated fields. Water staining surveys have shown that none of the proposed therapeutic sites have any direct connection to sinkholes, so no contaminants can enter these sites from the fields.

Microbiological examination of the cave system is essential for successful therapy, as it provides information about the purity of the underground environment, especially the rocks, water and air and any harmful or allergenic microorganisms they may contain. Microorganisms can exist in caves without light, using the energy stored in organic or inorganic materials found there. Microscopic fungi are mostly found on dead plant or animal remains, feces, especially guano.

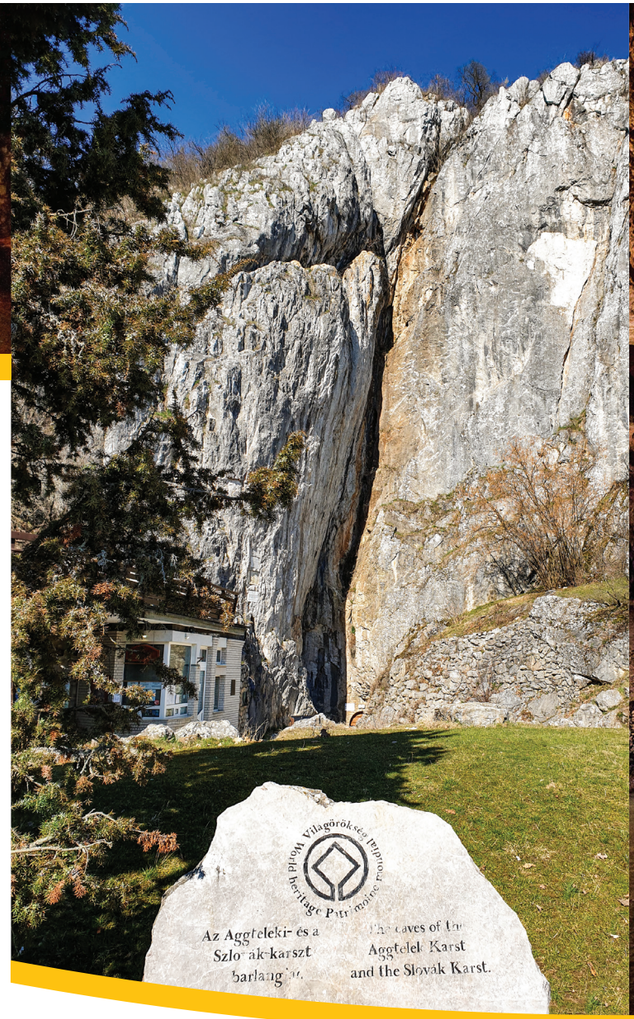
Microorganisms enter the caves primarily from the surface through the air or water through karstic fissures and sinkholes.

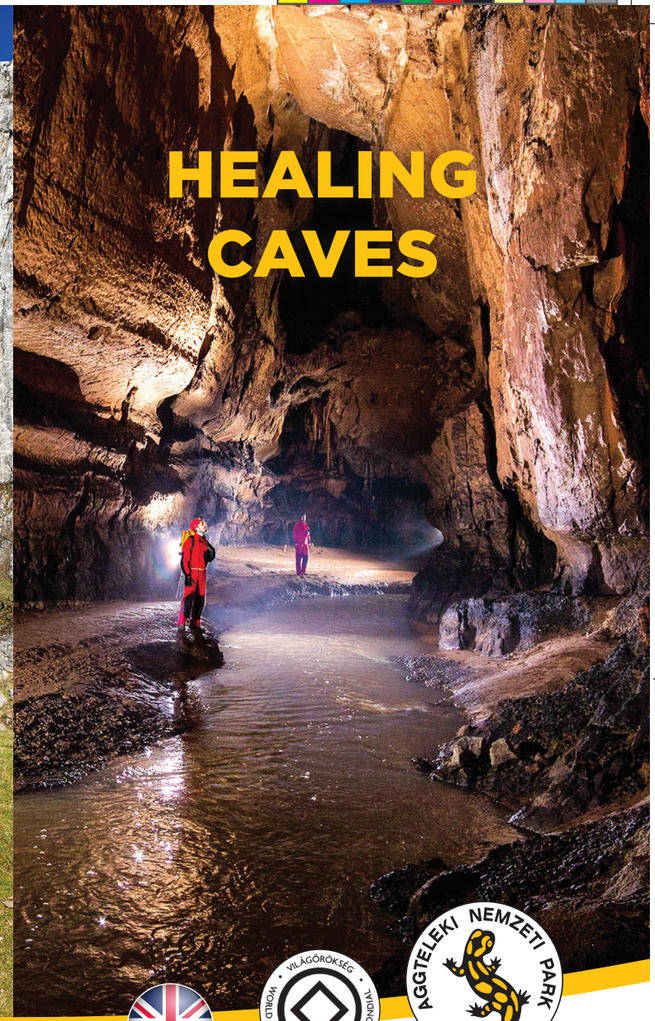
Sampling and cultivated microorganisms

The whole Baradla-Domica cave system and its surface environment is located in the territory of two national parks: the Slovak Karst National Park in Slovakia and the Aggtelek National Park in Hungary. It's area roughly matches the surface area of the caves of the Aggtelek karst and the Slovak karst, added to the UNESCO World Heritage List in 1995. Due to the abundance, the complexity, the relative lack of disturbance and the concentration of formations in a small territory, the karst caves and objects of the Slovak and Aggtelek Karst regions are exceptionally significant. This area contains more than 1400 known caves. The karst phenomena produced a variety of formations and habitats, significant in terms of geology, morphology, biology and archaeology. There isn't any other place in the temperate climate zone with such a complexity of caves.

The karst region of the two national parks provides many interesting sights to the visitors. Moreover, all these sights are located in a healthy environment, since the karst region is far from any industrial facilities – most of the karst is covered by forests.

A typical animal species of the cave system: the *Niphargus aggtelekiensis*





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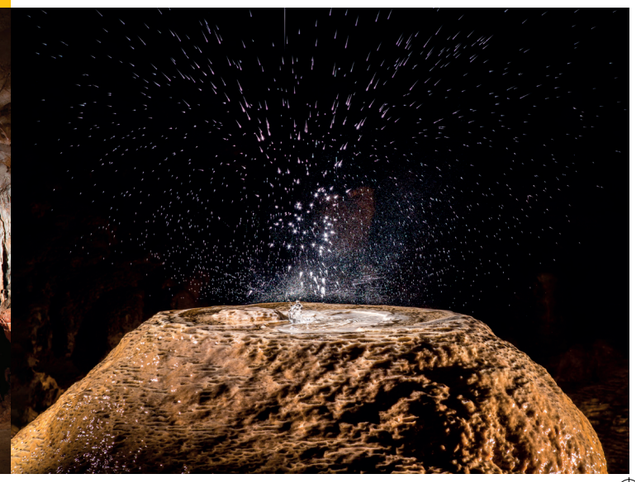
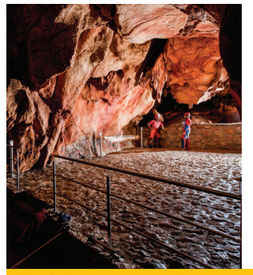
Back in the early 19th century, it was discovered that miners at the salt mine in Wieliczka, Poland were more productive underground than their counterparts working in other mines. The healing effect of Klutert Cave in Germany was discovered by people fleeing from the bombings of World War II. After a ten-year research, cave therapy was officially started in Hungary in 1969 when one of the caves of the Aggtelek karst, Béke Cave – as the first such cave in Hungary – became a certified healing cave.

Meanwhile, the number of patients with respiratory and allergy complaints increases, not only nationwide, but also across Europe. The increased levels of air pollution, high chemical content of food, unhealthy lifestyles, lack of outdoor activities all contribute to the dysfunction of the immune system and to the development of various diseases.

Recognizing this, the experts of the Aggtelek National Park Directorate and the Slovak Cave Administration decided to utilize the potential of the extensive passages and chambers of the Baradla-Domica cave system for the noble purpose of healing. The financial background required for the development was provided by the two organizations participating in the *"Slovakia-Hungary Cross-border Cooperation Program 2014-2020"* launched by the European Union.

Cave therapy (speleotherapy) or subsurface climate therapy utilizes the special features of the environment, especially karst caves, to treat chronic and allergic respiratory diseases. Scientific research has shown that the properties of many caves are comparable to those of high-altitude climates and in some cases even surpass these. Research has also demonstrated other beneficial physical, chemical, and microbiological aspects of cave air. These are mainly low – constant – temperature, high humidity, relatively slow airflow, high concentrations of negative ions, and higher-than-normal natural radiation.





The finished therapeutic chambers of Domica and Baradla Caves

Cave aerosol microparticles negatively ionize air and are saturated with a range of valuable elements such as calcium and magnesium. The cave aerosol supports mucus clearance, the mucus production of the bronchial cells increases due to the negative ions, so it becomes easier to discharge the mucus by coughing. This leads to a significant reduction of symptoms of patients with chronic lung diseases and asthma. The positive clinical effect of cave treatment (speleotherapy) lasts for 6 months, in some cases even several years after treatment.

Cave therapy greatly contributes to the dosage reduction of antibiotic and steroid drugs and to the reduction or even disappearance of asthmatic attacks.

A therapeutic cave or a cave therapy institute is a properly designed and equipped natural cave formation or other underground space (mine, adit) utilising its proven special therapeutic atmospheric conditions to treat specific diseases.

In both parts of the cave, therapeutic sites have been selected beyond the route open to visitors. Therapies would disrupt not only the visits to the caves, but also vice versa, as visitors could be potential carriers of bacteria and could also introduce allergen dust or pollen particles into the cave.

In order to prove the healing effect of the selected sites, in addition to medical physiological examinations, several other examinations and measurements had to be performed, covering geophysical, climatological, hydrological, hydrochemical, radiophysical and microbiological aspects.

Geophysical surveys

Geophysical surveys were mainly required to find out the stability of rocks and sediments in the underground passages, but they also contributed greatly to understanding the formation process of the cave system.

As in most caves, in the vast majority of the Baradla–Domica cave system, only minor climate changes can be observed. However, compared to the surface, the values of relative humidity are much higher here, reaching 95–100%. Typical carbon dioxide concentration values range from 0.1 vol% in winter to 0.4 vol% in summer, aiding respiratory therapy patients, making them breathe deeper and faster.

Experts also checked the presence of radiation in the cave system. Radon formed in rock or soil can get trapped in the soil or rock particles, or leaving the particles, it may enter the pore space or fissure system of the soil or rock. Radon released into the atmosphere may accumulate in poorly ventilated spaces, where its concentration increases. For example, high concentrations of radon may occur in poorly ventilated parts of caves.

Climate surveys