THE CLAY "AQUIFER" OF THE "HUNYADI JÁNOS" AND "FERENC JÓZSEF" MEDICINAL WATER

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Hungary, and also Budapest is known for being rich in balneological medicinal water. However, in the South part of Buda, there is a special medicinal water, which is bottled and used since the end of the 19th century. This is a bitterish taste laxative water called "Bitterwasser" (German) or "keserűvíz" (Hungarian). In the beginning of the 20th century, six different area was utilised just in the capital for bottling this special high TDS-content groundwater. Two of them is still working. Their trademarks, namely the "Hunyadi János" and "Ferenc József" medicinal water is still represents the mood of the Austro-Hungarian Empire. This "Bitterwasser" is a shallow groundwater, enriched in Na^+, Mg^{2+} and SO_4^{2-}. It is yielded from simple digged wells in two small plain basin situated between the Buda Hills and the Tétényi Highland. The basins are filled by thick Oligocene aged clay layers. In this case, the "aquifer" of the medicinal water is also this compact Kiscell Clay! Geochemical, geophysical end even geothermal anomalies, and special flora is known to be related to this area. The protection area of the wells is one of the few remaining green fields inside Budapest.

The research about the characteristics and the genesis of this "Bitterwasser" was one of the first topic of the Hungarian geologists. The first analyses of the groundwater was made in 1863. The first theory about the origin of this groundwater was constructed by Szabó in 1868. Since than, most of the great Hungarian geologists had some work related to this special groundwater. The theory about the genesis of this groundwater was improved by Schafarzik (1902) and later by Vendl (1948). The most known theory published by Vendl was based on field and microscope description of the clay layers, and also on some chemical analyses. According to our information, there were no modern mineralogical and geochemical studies since that time. Our aim was to reinvestigate the geology and hydrogeology of the area, which work included state-of-art mineralogical and chemical study of the clay layers. In this case, new results about the origin of this special groundwater can take part an important role in the determination of a new protection area.

The clay layers of the mineral water fields are really characteristics. On the surface there is a 10–30 cm thick organic-rich clay. Under this there is a spotted clay: the dominant colour is yellow, with greyish-blue fragments. This clay matrix is full of gypsum, the amount is increasing downwards. Between 2 and 3 m, crystalline gypsum represents about 50% of the material in the central areas of the well-fields. The size of these crystals varies between 1 mm to 3 cm. There is a 30 cm thick dominantly grey, yellow-potted clay layer under 3 m, and then a uniform greyish-blue clay layer begins. We found this basic layer until at least 35 m. The upper part of this layer is also containing some gypsum especially large crystals as fragment fillments.

According to the classical theory, the formation of gypsum and the medicinal water is related to the oxidative process of the unsaturated zone. This is beginning with the production of sulfuric-acid from pyrite. Then the clayey material is decayed by this acid, and gypsum is precipitated as a result of this reaction. The blue-coloured clay represents the original pyrite-rich material, while the upper yellow clay is the oxidated phase. According to this theory the process will be finished when all pyrite of the upper 3 m will be lost. A hydrogeological interpretation (Tóth 1995) states that the basins are recharge areas, so most part of the gypsum is simply exaggrageting from the dissolved content of the upcoming groundwater. We are investigating the validation of both theory, using field measurements and chemical and isotopic analyses of the new samples.

The preparation of the samples was quite difficult in this case due to the high amount of gypsum in the material. We investigated yellow, blue and brown clay samples by XRD, and they were quite similar in mineral composition and oxidative state. We find no sign of pyrite or any other Fe-rich mineral in the samples. There was only one sample from a more sandy layer, in which some goethite could be find. The previous documents mention only dolomite in the material, but we find the presence of calcite is much more important. The dominant mineral of the clay was the smectite in most of the samples.

According to our preliminary results, the classical theory of Vendl cannot be the main process resulting this special situation. The most part of gypsum and the mineral water must be a result of some other, probably more difficult processes.

References

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