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Influence of chemical composition of groundwater/drinking water on health status of inhabitants of the Slovak Republic

Stanislav Rapant*¹, Veronika Cveckova¹, Katarina Fajcikova¹, Jana Michalcova, and Beata Stehlikova

¹State Geological Institute of Dionyz Stur (SGIDS) – Mlynska dolina 1 81704 Bratislava, Slovakia

Abstract

Presented paper deals with relationship between chemical composition of groundwater/drinking water and health status of inhabitants of the Slovak Republic. Primary datasets consist of national database of chemical analysis of groundwater (20,339 analyses, 34 chemical elements/compounds) and data on health status of population. Health status is evaluated through 14 health indicators, including the most common causes of deaths in Slovakia, cardiovascular and oncological diseases, diseases of gastrointestinal tract and respiratory system as well as life expectancy and potential years of lost life. Data on chemical composition of groundwater and health indicators were unified into equal form and expressed as average values for each of 2,883 municipalities of the Slovak Republic. Pearson and Spearman correlation and method of neural networks were used for analysis of relationship between environmental and health indicators. Following chemical elements were identified as most influential in relation to human health: water hardness, Ca, Mg, T.D.S., HCO₃⁻, NO₃⁻ and SO₄²⁻. The most significant relationship between health indicators and chemical elements in groundwater was documented for water hardness, calcium and magnesium. At deficit levels of these elements we observe significantly worse levels of health indicators as well as lower life expectancy. We have defined following limit values: Ca > 60 mg l⁻¹, Mg > 25 mg l⁻¹ and water hardness > 2 mmol l⁻¹, at which mortality for evaluated diseases is the lowest and life expectancy is the highest. Defined limit contents are two times higher compared to Slovak guideline for drinking water. This research has been performed within the project Geohealth (LIFE10 ENV/SK/086) which is financially supported by the EU's funding instrument for the environment: Life+ programme and Ministry of the Environment of the Slovak Republic.

Keywords: groundwater, chemical composition, health status of population, limit values, Slovak Republic

*Speaker