Geological component of the environment and breast cancer, Slovak Republic

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This study deals with the analysis of relationship between 67 environmental indicators in geological component of the environment and breast cancer mortality in Slovakia. Primary input data comprises of the database of 33 environmental indicators for groundwater and 34 environmental indicators for soils, calculation is based on national geochemical data as a mean value for every Slovak municipality and the data on relative mortality from breast cancer for Slovak municipalities (about 2900 units) compiled for the period of 22 years (1986-2008).

The training neural network was used as mathematical model for data analysis. The top 200 networks has identified 12 environmental indicators (8 for soils and 4 for groundwater) with high rate of influence and 55 environmental indicators were found not to be influential with regard to the studied relationship. As the most influential environmental indicator was identified pHKCl in soil that should be within the range of acids, definitely under the neutral point. Further, the second most influential indicator was Ba in the groundwater with contents at the lowest levels (criti-

cal level is 0.39 mg l^{-1}). Similar results were found for the groundwater contents of SiO2 (at the lowest level, critical level 27.9 mg l^{-1}) and Zn (up to 0.24 mg l^{-1}, critical level 2.21 mg l^{-1}). Some environmental indicators were unambiguously identified as negative (Ba and Fe in groundwater, Mg, Ca and carbonates in soils). These indicators should be at the lowest level of their concentration in related geological component. Three environmental indicators, Ce, Na and Co in soils, had parabola function where certain essential concentration levels of these elements are presumed with protective effect on human health. For all influential indicators limit values with respect to the lowest mortality were proposed. The verification of achieved results was performed through regressive model of breast cancer mortality for 12 calculated influential environmental indicators for all municipalities in the Slovak Republic. The revealed difference between real mortality levels and the model values was found for 6 environmental indicators (Ba and Zn in groundwater, pH_{KCl}, Mg, Ca and Sr in soils). Each executed limit has decreased breast cancer mortality for about 0.79 cases per 100 000 inhabitants. Ex-

ecuting defined limits the long-term mortality from breast cancer was evidently lower.

References

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