

Asthma, respiratory allergy and cough

Chemical analysis of air in the complex of underground chambers of the "Wieliczka" Salt Mine Health Resort

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Salt aerosol is one of the therapeutic agents present in the atmosphere of the underground Health Resort in the "Wieliczka" Salt Mine. It has an osmotic effect and a beneficial impact on the respiratory tracts, increasing the activity of ciliary movement of the bronchial epithelium stimulating excretory activity of the respiratory tract. The quality of air is very important for the treatment of respiratory diseases; too high concentration of aerosol particles in the inhaled air could pose some threat to the maintenance of normal respiratory functions of persons suffering from asthma or COPD.

Aerosol sampling was conducted by means of the aspiration method in the complex of chambers of the "Wieliczka" Salt Mine Health Resort during the period from 7 to 20 June 2015. The samples were measured for aerosol concentration and analysed for organic carbon (OC) and elemental carbon (EC) content as well as for ions of Cl^- , NO_3^- , NO_2^- , Br^- , PO_4^{3-} , SO_4^{2-} , F^- , I^- , Na^+ , NH_4^+ , K^+ , Ca_2^+ , Mg_2^+ .

Aerosol concentration in the salt chambers of the Health Resort averaged 32 mg/m^3 . Aerosol concentration at the entrance to the Health Resort complex is on average 19 mg/m^3 (including 7 mg/m^3 respirable aerosol). The collected samples of total and respirable aerosol from the incoming air to the Health Resort chambers complex consisted mainly of sodium and chlorine (as Na^+ and Cl^-). A minor proportion by weight of the aerosol were sulphate (SO_4^{2-}), ammonium (NH_4^+), calcium (Ca_2^+) and phosphate ions (PO_4^{3-}). All marked ions of water-soluble compounds of the aerosol (salts) represents on average 90% of the aerosol mass and 88% of the total weight of the respirable aerosol.

The results confirmed high purity of the air in the Health Resort complex. What was noted was that the share of total sodium chloride aerosol mass and its concentration in the tested samples had many times exceeded the concentrations confirmed in seaside towns. Aerosanitary conditions prevailing in the underground complex of Health Resort chambers favour medical activity aimed at the treatment of chronic respiratory diseases.