



Studies of relation between basic socially significant diseases and ecological and meteorological factors for a number of industrial and recreation regions of Russia

G. Golitsyn (1), V. Vasin (2), I. Granberg (1), A. Ginzburg (1), N. Efimenko (2), E. Chalaya (2), N. Povolotskaya (2), Z. Kortunova (2), I. Senik (1), K. Rubinstein (3)

(1) A.M.Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences, Moscow, Russia, (2) State Institution "Pyatigorsk Research Institute of Curortology" of the Ministry of Public Health of Russian Federation, Pyatigorsk, Stavropol region, Russia, (3) State Institution "Hydrometeorological Research Center of Russia", Moscow, Russia, (igran@ifaran.ru / Phone/fax: +7(495)953-21-58)

The complex climatologic and medicophysiological studies carried out in the last few decades have revealed a high sensitivity of patients having problems with their cardiovascular organs, respiratory and digestive apparatuses, and nervous system to the effects of weather conditions, heliogeophysical factors, and pollutant concentrations in the atmospheric surface layer.

The studies show that, under unfavorable weather conditions, not only sick people but also healthy people with a meteorological hypersensitivity may have meteopathic reactions. These recurring reactions may result in the onset of the symptoms of dysadaptive and pathological disorders. It is not by accident that an increase of chronic pathology is related to an observed (all over the world) wide spread of meteopathic reactions and states.

To solve the problems related to the state of meteorologically sensitive people under the conditions of changeable weather (including pressure and temperature differences), improvements in the methodology of forecasting the "biotropic" types of weather, which often cause an acute attack or development of the basic socially significant diseases—such as cardiovascular, bronchopulmonary, nervous, and dermal diseases, disorders of digestive apparatus, arthropathy, and others—are very urgent.

In recent years, on the basis of the CMW (Caucasian Mineral Waters) health re-

sorts, scientists of the Pyatigorsk State Research Institute of Curortology of the Ministry of Public Health of Russian Federation, A.M.Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences, and Russian Hydrometeorological Research Center with participation of the Stavropol Meteorological Agency have been developing the system of on-line medical weather forecast within the framework of the project of the Basic Research Program of the RAS Presidium “Fundamental Research for Medicine”.

We have established that, in developing the criteria of unfavorable weather conditions, the notion of unfavorable meteorological conditions must necessarily include an estimate of the level of atmospheric pollution, especially for megapolises and recreation regions.

On the basis of the studies carried out, we consider that the dependence of meteopathia on weather, geophysical, and anthropogenic factors can be represented in the following form:

Weather Pathogenicity Index (WPI) for Medical Weather Prognosis

(N.P. Povolotskaya, I.G. Granberg, N.V. Efimenko, and A.P. Sklyar)

$$WPI = SPP (k_1 T + k_2 \Delta T_{bd} + k_3 \Delta T_{cn} + k_4 P + k_5 \Delta P_{bd} + k_6 \Delta P_{cn} + k_7 V + k_8 N + k_9 UF-B + k_{10} e + k_{11} O_2 + k_{12} \Sigma I / KUI + k_{13} O_3 + k_{14} CA + k_{15} S) / n,$$

where: SPP – synoptic weather type; \bar{t} – air temperature; ΔT_{bd} , ΔT_{cn} – temperature interdiurnal variability and deviation from climatic norm; P – air pressure; ΔP_{bd} , ΔP_{cn} – pressure interdiurnal variability and deviation from climatic norm; V – wind speed; N – low cloudiness; UF-B – intensity of UF solar erythema-making radiation; e – aqueous tension; O_2 – oxygen mass content; $\Sigma I / KUI$ – light ions sum to ions unipolarity factor ratio; O_3 – hourly ozone concentration; CA – mass concentration of sub-micron aerosol; S – dangerous meteors; n – number of parameters; k_1 ; k_2 ; k_3 ; k_4 and so on – coefficients, depending on parameter biotropy.

Thus, we have developed a modern method of performing a medical weather forecast with consideration for atmospheric-pollution effects, which may be used in medicine. Note that the coefficients, which must be substituted into the proposed formula, correspond to a specific procedure of performing a medical weather forecast for a certain region (by now, these coefficients have been determined for low-mountain resorts).