

# The role of the climate in complex treatment of respiratory disease<sup>1</sup>

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## Abstract

The climatotherapy associated with favourable environmental conditions is an important factor for improvement human health. In this paper, we had presented results from selected studies carried out in Šrobár's institute for tuberculosis and respiratory diseases Dolný Smokovec in the High Tatras. Šrobár's institute was for many years specialised health care institution providing complete in patients and outpatients therapeutic and preventive care for children of 0–18 years of age. Cooperation all together with Pediatric clinic St Andrea hospital of Università La Sapienza in Roma performed in 2002 all together with Rabka Zdroj Institute and Motol hospital Prague, showed interesting results. We had found out that children suffered respiratory allergy and asthma had lower level of values of MEF25 (middle forced respiratory flow on the level of 25% of peak respiratory flow) at the first day of hospitalization in opposite to the values after one-week treatment. On the other hand, the level of FeNO concentration (forced expired nitrogen monoxide) was significantly lower after one-week treatment. Children's without chronic allergy and asthma, values of MEF 25 and FeNO were unchanged.

**Key words:** climatotherapy, heliotherapy, respiratory disease

**Słowa kluczowe:** choroby układu oddechowego, leczenie światłem słonecznym, talassoterapia

## Congratulation

I'd like congratulate to Janusz to his jubilee and I wish him all the best to next long life.

I'd like thanks many times for his friendship and for possibility to gone many years all together with him. Many thanks for opening the door to the science and close cooperation. Due to activity of us together (Janusz and me) had started before 25 years Vojtek-Rudnik days... We had found before 25 years access to the ministry of health from Poland (Dr. med Vojtyła) and Slovak (MUDr. Soboňa) and whose confirmed negociation about close cooperation of Rabka and Dolny Smokovec institutes on highest political level... And Janusz was all the time very correct friend. We have all together prof R. Ronchetti and colleagues same research activities, like a paper I enclosed.

One more Janusz Thanks a lot... And I am honored of to be Your friend and Your colleague for long 25 years. It s a pity that this years was flown so fast...

Vlado, Ala, Marek, friends from the IV Pediatric Clinic SZU Poprad and Šrobars Institute, Dolný Smokovec

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## Introduction

The role of climate and environmental conditions on the treatment of different diseases is known more than 6000 years. Document "Air, waters and places" written by Hippocrates is considered as the first scientific document about bioclimatology. Latter Celsius and mainly Galenos had used spa environment of Castellamare under the Vezuv (Italia) for the tuberculosis (tb) treatment. Another famous physician Avicena recommended for his patients suffered tb the Kreta forests. Ever green coniferous forest was considered as appropriate complementary treatment for tb patients. Better knowledges about bioclimatic conditions has continued during 17<sup>th</sup> century due to development of new technologies for measurement of meteorological parameters. The meteorological laboratory prepared by Domo in 1905 can be regarded as the first step for helio and climatotherapy development. The climatotherapy in Slovakia had been started during the first decades of 20<sup>th</sup> century due to endavour physicians as Stibor, Matoušek, Barcal, Hensel, Kolesár and others.

## Climatotherapy

Laznička [5] defined climatotherapy as tool for improving the human health using good environmental conditions. Ponikowska [8] declared air temperature, wind velocity, air humidity and solar radiation (effect on synthesis of vitamin D in human body) as main meteorological factors of climatotherapy. As you can know the role of vitamin D is nowadays arising as a factor influencing immunity.

Climatotherapy is considered as a part of complex therapy of the respiratory disorders in many European countries including Slovakia. Despite of this, up to this time we have no satisfactory experiences and scientific information about the influence of environmental and climatic conditions on the human health.

## Effect of climate on human health

Brimkulov [1] presented results of treatment of 132 patients cohort in North Thien Shane on the altitude of 3200 m a.s.l. He presented very good results associated with the steroidogenesis and the pulmonary surfactant production. Schuh [9] declared that successful climathotherapy is based on the several weeks durated therapy in appropriate environmental conditions. Engst and Vock [2] confirmed positive effect of forest climate (over the altitude than 1560 m a.s.l.) It was comparable to influence of see areas on the treatment of the allergic dermatoses, psoriasis, T-cels lymphomas and bronchial asthma. McVernon et al. [7] investigated influence of the climate conditions to the *H. influenzae* type B infection during repeated respiratory disorders. They concluded that longer residence in cold indoor conditions during autumn and winter seasons is causing repeated infections. Marco de et al. [6] observed influence of NO<sub>2</sub> pollutants from the roads and traffic to the prevalence of the bronchial asthma and allergic rhinitis in Italia. Obtained results confirmed that incidence and prevalence of bronchial asthma arising due to increasing NO<sub>2</sub> concentration on air. NO<sub>2</sub> is transformed into O<sub>3</sub> pollutions in atmospheric boundary layer. Emissions from road transport and industry can be effective due to secondary air pollution (O<sub>3</sub>) not only in urban areas but also in rural and mountain environment [3].

## High Tatras as a resort for climatotherapy

The respected physician Dr. Szontag is considered as a founder of climatotherapy in High Tatras. After his came back from the Switzerland at the end of the 19<sup>th</sup> century, he started to employ the climate of High Tatras for therapeutic procedures of the hotel guests. Hotels had been transformed to the sanatories continuously. Sanatories used cold and dry air as well as moderate High Tatras climate and intensive solar irradiation for treatment of the patients. Selected climate characteristics for different sites of High Tatras are declared in **Table I**.

Sites	Rglob W m <sup>-2</sup>	Wind > 10 ms <sup>-1</sup>		Foggy days
		a	b	
Poprad, 672 m a.s.l.	877	1.1	109	33
Skalnaté Pleso, 1778 m a.s.l.	1013	1.3	189	203
Lomnický štít 2634 m a.s.l.	1058	2.1	203	269
Rglob/Solar radiation – mean noon values of global radiation (Smolen and Ostrožlik in [3])				
Wind speed a/Relative frequency of days (%) with mean daily wind speed above 10 m s <sup>-1</sup> (Konček and Orlicz in [4])				
Wind speed b/Mean number of days with strong blast of wind above 10 m s <sup>-1</sup> (Konček and Orlicz in [4])				
Foggy day/Mean annual number of foggy days during period 1941–1960 (Orliczowa and Peterka in [3])				

**Table I.** Selected climate characteristics for different altitude sites in the High Tatras obtained for 1930–1960 period.

### Medical research of respiratory diseases in the High Tatras

Srobar's Institute is one of the oldest health care providers in High Tatras. Formerly (1919) started as a hospital for children suffering from tuberculosis. During a long time the tradition was changed due to changed epidemiologic situation. In incidence and prevalence tuberculosis. From the 1984 year interesting of the institution was addressed to the nonspecific children's respiratory disorders and research of these diseases. Sanatorium is situated on altitude of 860–1010 meters o.s.l. on the southeast down hills of the High Tatras.

Research was focused to evaluation of the complex problems of specific and nonspecific respiratory disorders (pharmacotherapy, respiratory physiotherapy, exercise activity, dietotherapy, elimination from the home environment). This research was aimed on influence of the complex therapy and influence of the High Tatras environment to clinical improvement of the children's suffered of non specific respiratory diseases. This was carried out during years 1986–1988. The results of the study confirmed, that nearly 2 months of complex therapy supported by appropriate climatic conditions had positive effect on functional status of the sick children. Experiences based on cooperation of the Srobars institute researchers all together prof. Zapletal from Motol hospital Prague showed the worsening of functional status of children coming back to their home environment (Prague) after 2–3 months period. These experiences accent importance of repeated climatotherapy. MEF<sub>25</sub> and PEF (characterized value of the level of maximal expiration during maximal forced expiration) and AEX (area under the line of PEF) were recognized as relevant parameters for classification of the functional status of the children respiratory airways.

During of the year 2002 we had done all together with cooperation of prof. Ronchetti from Roma and prof Haluszka from Rabka international research dedicated to "Influence of climatic treatment in the low allergenic environmental condition to the trend/development of the exhaled FeNO". Cooperating researches were: Z. Bohmerová, M. Baretto, T. Michnova, R. Ronchetti, J. Haluszka, V. Pohanka.

Group of 33 children (mean age  $10.6 \pm 2.4$ , sexual ratio b/g: 16/17) had been included to the study. 17 children suffered from asthma (AB) and atrophy. 8 of them had received ICS (inhalatory corticosteroids) and 9 of them were without any therapy. Additional 16 children had not confirmed asthma. All children were separated to the 2 groups:

- I group – the first procedures were done immediately after admission to hospital;
- II group – the first procedures were done after one week hospitalization.

For the evaluation we had used measurement of parameter FeNO (concentration of the expired nitric oxide) measured by Sieves analyser NOA 280TM and spirometer (Spirolab II MIR). The evaluations had confirmed that level of the FeNo was usually increased in the patients not sufficiently treated for their allergic asthma symptoms.

Results of the study showed that (**Table II**):

- for non-allergic children, the levels of the flow volume parameters and FeNO concentration were comparable for both I and II group of the patients;
- allergic children suffered asthma bronchiale in II group had significantly lower level of the MEF(FEF)<sub>25</sub> at the beginning in comparison to children of group I;
- parameter FeNO, had significantly lower level after one week therapy.

Non-asthmatic children	I group (n = 8)	II group (n = 8)						
			1 <sup>st</sup> day	7 <sup>th</sup> day	p	1 <sup>st</sup> day	7 <sup>th</sup> day	p
eNO 58 mL/s		6.3	6.6	n.s.	6.4	8.7	n.s.	
FVC (%)		97.9	102.9	n.s.	104.0	102.0	n.s.	
FEV <sub>1</sub> (%)		100.6	101.5	n.s.	102.9	98.7	n.s.	
FEF <sub>25-75</sub> (%)		99.9	100.1	n.s.	100.1	92.8	n.s.	
Asthmatic children	I group (n = 10)	II group (n = 7)						
			1 <sup>st</sup> day	7 <sup>th</sup> day	p	1 <sup>st</sup> day	7 <sup>th</sup> day	p
eNO 58 mL/s		9.4	9.7	n.s.	8.7	5.1	0.018	
FVC (%)		97.9	102.9	n.s.	100.1	100.2	n.s.	
FEV <sub>1</sub> (%)		100.6	101.5	n.s.	91.9	94.6	n.s.	
FEF <sub>25-75</sub> (%)		99.9	100.1	n.s.	68.3*	75.9	n.s.	

**Table II.** Results of measurements of parameters for classification of functional status of the children respiratory airways.

\*  $p = 0.019$  between I and II group

## Conclusions

Climate is an important factor influencing human health. Nowadays there is a lot of references about the changes of the environment and consequences arising from this fact to not only for human health, but about the consequences of global warming to the earth and life... Certainly there is a lot of references in the world, confirming this opinions. Very good example for confirmation of this words are the consequences in High Tatras after Bora wind in 2004.

It is a pity in occasion of the High Tatras, that commercial tendencies an interestings of the business groups are over all of the real needs of this region.

As I recognized the researcher's tendencies in Poland Jagiellonian University Krakow, they prepared much more better conditions for understanding what's surrounded environment need's are and what is good for evaluation of the epidemiological problems of the humans. Application of advanced technologies for evaluation and correction of the environmental situation is very important because there are arising possibilities for application of advanced technologies all together climatotherapy procedures, able to improve quality of patients life and to achieve cost effectiveness and cost benefit of the management of quality of life.

## Notes

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## References:

1. Briumkulov N.N., *The alpine climatotherapy of bronchial asthma patients*. „Terapevtičeskij archi.” 1991; 63, 8, 25–30.
2. Engst R., Vocks E., *High-mountain climate therapy for skin diseases and allergies – mode of action, therapeutic results, and immunologic effects*. „Rehabilitation” (Stuttg.) 2000; 39, 4, 215–222.
3. Fleischer P., Bičárová S., Godzik B., *Desať rokov monitorovania vplyvu troposférického ozónu na lesy v TANAPe*. Štúdie o TANAP, in press, 2009.
4. Konček M. et al., *Klíma Tatier*. Veda, Bratislava 1977, 856.
5. Lázníčka J., *Klimatoterapie*. In Romano hangos [online], 2004 [cit: 2004.04.10], <http://www.romanohangos.cekit.cz/clanek.php,idclanek=1193>
6. Marco de R. et al., *The impact of climate and traffic-related NO<sub>2</sub> on the prevalence of asthma and allergic rhinitis in Italy*. „Clinical Experimental Allergy” 2002; 32, 10, 1391–1393.
7. McVernon J. et al., *The influence of climate on Invasive Haemophilus*, 2004. University College London – Seasonal Weather Forecast web.site: <http://forecast.mssl.ucl.ac.uk/docs/McVernonet2002.pdf> [cit: 2012.11.20].
8. Ponikowska I. et al., *The Clinical principles of Balneology and physical medicine*, 2004 [online] on The American Massage Therapy Association – web site: [http://www.amtamassage.org/journal/winter03journal/balneology\\_page.html](http://www.amtamassage.org/journal/winter03journal/balneology_page.html) [cit: 2012.11.20].
9. Schuh A. *Climatotherapy*, “Experientia” 1993; 49, 11, 947–956.