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**THE FUNCTIONAL STUDY OF THE LUNGS
DURING POLLEN BRONCHIAL ASTHMA**

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**Foreign Technology Division
Wright Patterson Air Force Base, Ohio**

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
Б б	<i>Б б</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З з	<i>З з</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й й	<i>Й й</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

* ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ѣ in Russian, transliterate as yě or ѣ.
The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

FOLLOWING ARE THE CORRESPONDING RUSSIAN AND ENGLISH
DESIGNATIONS OF THE TRIGONOMETRIC FUNCTIONS

Russian	English
sin	sin
cos	cos
tg	tan
ctg	cot
sec	sec
cosec	csc
sh	sinh
ch	cosh
th	tanh
cth	coth
sch	sech
cach	cach
arc sin	sin ⁻¹
arc cos	cos ⁻¹
arc tg	tan ⁻¹
arc ctg	cot ⁻¹
arc sec	sec ⁻¹
arc cosec	csc ⁻¹
arc sh	sinh ⁻¹
arc ch	cosh ⁻¹
arc th	tanh ⁻¹
arc cth	coth ⁻¹
arc sch	sech ⁻¹
arc cach	cach ⁻¹
<hr/>	
rot	curl
lg	log

GREEK ALPHABET

Alpha	A	α	•	Nu	N	ν
Beta	B	β		Xi	Ξ	ξ
Gamma	Γ	γ		Omicron	Ο	ο
Delta	Δ	δ		Pi	Π	π
Epsilon	E	ε	•	Rho	Ρ	ρ •
Zeta	Z	ζ		Sigma	Σ	σ ς
Eta	H	η		Tau	Τ	τ
Theta	Θ	θ	•	Upsilon	Υ	υ
Iota	I	ι		Phi	Φ	φ ϕ
Kappa	K	κ	•	Chi	Χ	χ
Lambda	Λ	λ		Psi	Ψ	ψ
Mu	M	μ		Omega	Ω	ω

THE FUNCTIONAL STUDY OF THE LUNGS DURING POLLEN BRONCHIAL ASTHMA

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A. D. Ado)**

Pollen asthma is a typical example of the atopic form of bronchial asthma according to the clinico-pathogenetic classification of Academician A. D. Ado and Professor P. K. Bulatov. This disease has been insufficiently studied in our country. Its diagnosis is based on the results of allergologic study and is conducted in specialized offices.

Early diagnosis and the specific hyposensitization of pollen asthma are very important in the prophylaxis of severe forms of bronchial asthma, since the disease is severe year-round in 33% of the patients in the absence of medical treatment (Rackemann, quoted by Feinberg, 1946).

Pollen asthma is a convenient model for studying pulmonary function during the atopic form of bronchial asthma, since the asthma attacks appear only during the period of flowering of specific plants (in the spring and summer).

In domestic publication there are individual reports about studies on pulmonary function during pollen asthma after the inhalation of a specific pollen allergen (Yu. A. Poroshina). Some work in foreign publication is also devoted to this question. Francis et al. studied the change in vital capacity in three patients, McAllen - in 40 patients; Colldahl (1952) studied the change in the time of washing nitrogen out of the lungs in 17 patients; Citron et al.; Citron recorded the change in the forced lung expiration per second in 24 patients; Bernstein et al. studied the change in the distensibility of the lungs and resistance to air flow in ten patients.

In this work the results are presented of certain functional methods of studying the lungs of patients with pollen asthma during the period of remission, and also after provocation by specific pollen allergens.

Thirty patients with pollen bronchial asthma were examined in the Allergology Department of the 1st City Hospital imeni N. I. Pirogov. The diagnosis was made based on data of allergologic anamnesis (clear seasonal fluctuation, combination with pollen rhinitis, conjunctivitis, nettle rash), positive scarified and intracutaneous tests with allergens from pollen of the following types of plants: gramineous grasses (timothy meadow grass, orchard grass, fescue grass), alders, nut trees, birches, composites (ordinary wormwood, common ragweed) and mountain spinach. Everyday (from domestic and library dust, pillow feathers) and food allergens (from hazelnut, sunflower seeds) were also used during the examination.

In twelve patients the light course of pollen bronchial asthma was observed (asthma attacks troubled them only with a high concentration of pollen in the air), in ten - average severity (asthma attacks were noted throughout the flowering period, they passed after using broncholithic substances), in eight - severe (asthma

attacks occurred with the minimum content of pollen in the air, they were persistent in character). The combination of pollen bronchial asthma with other clinical manifestations of pollenosis (pollen rhinitis, conjunctivitis, nettle rash) was noted in 29 patients.

Positive skin tests were obtained in six patients suffering from asthma attacks from the end of April to the beginning of June (the period of flowering of plants in the birch family), - with allergens from the pollen of alders, nut trees and birches; in nine patients with asthma attacks during June - July (the period of flowering of gramineous grasses) - with allergens from the pollen of timothy meadow grass, orchard grass, fescue grass; in twelve patients whose asthma attacks lasted from the middle of July to the middle of September (the period of flowering of the composites and mountain spinach), - with allergens from woodworm pollen. In three patients the period of illness coincided with the flowering time of several types of plants (gramineous grasses and composites, gramineous grasses and birches). Allergy to domestic dust was revealed in four patients, to hazelnuts - in six, to sunflower seeds - in two.

For studying pulmonary function and refining the etiology of bronchial asthma the following studies were carried out: the novodrine [isoproterenol] test; the acetylcholine test; the provocational innalation test with the determination of the threshold dose of the specific pollen allergen¹. In 19 patients, after the spontaneous restoration of bronchial passibility that was disrupted during the inhalation of the specific allergen, sensitivity to acetylcholine was repeatedly diagnosed.

¹The procedure of these tests is described in "Contemporary Practical Allergology" edited by A. D. Ado and A. A. Pol'ner. M., 1963, pp. 319-323, 329-332.

The inhalations of novodrine, acetylcholine and an allergen were conducted with the AI-1 nebulizer. The studies were made on the pneumotachometer of the Kiev Copper Processing Plant and on the apparatus "Compliancetest" ("Godart"). The expiration rate, the vital capacity, the forced expiration per second and the distensibility (compliance) of the lungs were determined. Distensibility is the capacity of the lungs to change in volume depending on the change in the intrathoracic pressure. The simultaneous recording of the change in intra-esophageal pressure (equal to the intrathoracic) and respiratory capacity makes it possible to obtain a "volume-pressure" diagram. Distensibility of the pulmonary tissues is calculated by dividing the value of the change in the respiratory capacity (ΔV , in ml) by the value of the change in the intra-esophageal pressure (ΔP , in cm of water column): $C = \Delta V / \Delta P$. The distensibility of the lungs in a healthy person is equal to 160 ml/cm of water column. For recording the change in the intra-esophageal pressure without preliminary anesthesia a catheter greased with liquid petrolatum with a small rubber balloon at the distance of 34-38 cm was introduced into the esophagus of the patient through the lower nasal passage. Ten minutes after fixation of the catheter the record of the "volume-pressure" diagram was produced.

The distensibility of the lungs in the patients with pollen asthma who are not allergic to domestic and food allergens varied from 147 to 280 ml/cm of water column, Tiffneau's coefficient equalled from 75 to 89%. The novodrine test was negative in 26 patients, in four - positive. The threshold dose of acetylcholine in the patients varied from 0.001 to 1%. During the repeated determination of the threshold dose of acetylcholine (after the provocation test with the specific allergen) in ten of the 19 patients a decrease in the sensitivity of the bronchi to acetylcholine was noted, in five - an increase; in four patients a significant change in sensitivity to acetylcholine was not noted

(these were the patients in whom the forced expiration per second after the inhalation of the specific pollen allergen was decreased by less than 20%).

In the seven patients with the severe course of the disease the threshold dose of the pollen allergen varied from 1:1024 to 1:128; in the twelve patients with the course of average severity - from 1:64 to 1:16; in ten patients with a light course - from 1:8 to 10,000 units of proteic nitrogen in one ml.

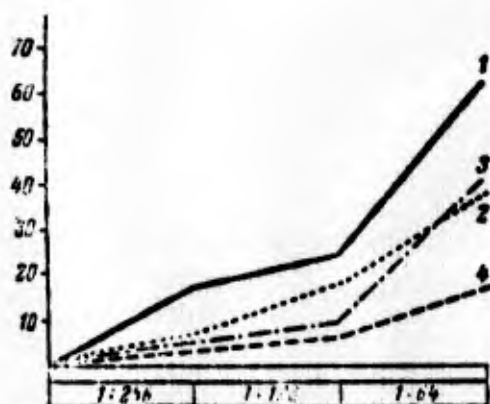


Figure 1. The change in the functional values of broncho-pulmonary apparatus after the provocation inhalation test in pollen asthma patients. Along the abscissa - the cultivation of the allergen from fescue grass pollen, along the ordinate - the change in the test (in %). 1 - distensibility of the lungs; 2 - expiration capacity; 3 - forced expiration per second; 4 - vital capacity.

to 11 years) does not differ from the normal during the period of remission.

The determination of the distensibility of the lungs, according to our data, is the most sensitive method for recording the change

The most sensitive method of recording the functional state of the broncho-pulmonary apparatus under the influence of a specific allergen is the determination of the distensibility of the lungs (Fig. 1).

The bronchospasm caused by inhaling the specific allergen usually passed rapidly after the inhalation of novodrine (Fig. 2). Complications during the production of the provocation tests with pollen allergens were not noted.

Our investigations showed that the function of external respiration in the patients with pollen asthma (duration from 1

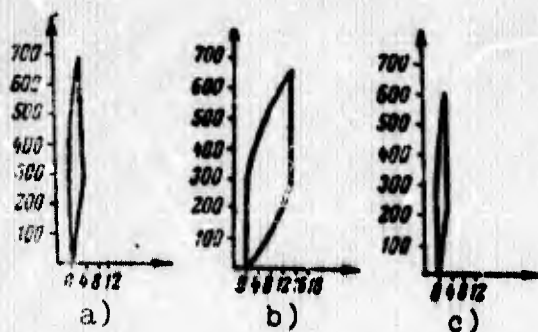


Figure 2. "Volume-pressure" diagram of the patient with pollen asthma. Along the abscissa - intra-esophageal pressure (in cm of water column), along the ordinate - respiratory capacity (in ml). a - before inhaling the pollen allergen (C - 169 ml/cm of water column); b - after inhaling the pollen allergen (C - 43 ml/cm of water column); c - after inhaling novodrine (C - 200 ml/cm of water column).

in the function of external respiration. This corresponds to the data of foreign authors (Engström; Colldahl). The value of this method lies in the fact that it does not require forced respiration which can cause a bronchospasm in patients with bronchial asthma, and it is more objective in comparison to spirographic and pneumotachometric methods, since its results do not depend on the patient's strength.

Higher sensitivity to acetylcholine was noted in the patients with pollen asthma during the severe course and the simultaneous

sensitization to domestic dust and foodstuffs. This agrees with the data of the foreign authors (Rusyllo et al.; Herxheimer; Tiffneau; Vrils et al.; Charpin et al., 1969). A decrease in the sensitivity of the bronchi to acetylcholine in ten patients after the provocation test confirms the early experimental data of A. D. Ado on decreased sensitivity to acetylcholine after the resolving action of the specific allergen. The allergen blocks the choline receptors of the smooth bronchial muscles, which causes a drop in sensitivity to acetylcholine. In the cases of the absence of expressed bronchospasm during the provocation test and respectively in the cases where the blocking effect of the allergen to the choline receptors is absent a change in sensitivity to acetylcholine was not found (in four patients). The increased sensitivity to acetylcholine in five of the patients is explained by the activation of choline receptive fields (the phase reaction).

The asthma attack appears after the inhalation of the specific pollen allergen in the patients with pollen asthma in the period of remission. The threshold dose of the pollen allergen corresponds to the severity of the disease's course: severe asthma attacks were observed in the patients with a small threshold dose of the allergen. The values of the external respiratory function rapidly return to the original level under the effect of broncholytic preparations. This is explained by the reversibility of the morphological changes in the immediate type allergic reaction (edema of the mucous membrane, bronchospasm, hyperfunction of the bronchial gland), characteristic of pollen bronchial asthma, unlike infectious-allergic asthma in which even during the period of remission after specific hyposensitization the distensibility of the lungs and other values of external respiratory function remain lowered (L. A. Goryachkina).

BIBLIOGRAPHY

- Адо А. Д. Антигены как чрезвычайные раздражители нервной системы. М., 1952. — Адо А. Д., Булатов П. К. В кн.: Материалы 5-й Межобластной научной конференции терапевтов. Л., 1969, с. 258. — Горючкина Л. А. Влияние специфической гипосенсибилизации на некоторые показатели внешнего дыхания при бронхиальной астме. Дисс. канд. М., 1971. — Порошина Ю. А. Специфическая диагностика, клиника и специфическая десенсибилизация поллиноза (сенной лихорадки). Дисс. канд. М., 1965. — Bernstein I. L. et al. Ann. Allergy., 1964, v. 22, p. 49. — Citron K. M. et al. Thorax, 1958, v. 13, p. 229. — Citron K. M., Acta allerg. (Kbh.), 1967, v. 22, Suppl., p. 17. — Colladahl H. Ibid., 1952, v. 5, p. 143. — Colladahl H. Ibid., 1960, v. 13, p. 395. — Herxheimer H., Int. Arch. Allerg., 1951, v. 2, p. 27. — McAllen M., Thorax, 1961, v. 16, p. 30. — Francis C., Lowell M. D. et al. J. Allergy., 1948, v. 19, p. 9. — Rusyillo E. et al. B. Ann. Symposium Allergologicum Internationale. Zagreb, 1964, p. 191. — Tiffeneau R., Int. Arch. Allerg., 1961, v. 19, p. 331.

The article is devoted to the study of the function of the lungs in pollen bronchial asthma. The authors used Tiffeneau's test, determined compliance test and applied pneumotachometry. A total of 30 patients with pollen asthma with an allergy to pollen of cereal grass, trees and wormwood were examined. Investigations were made during the period of remission and post-vaccinal inhalation test with a specific pollen allergen. Results of investigations showed that in pollen bronchial asthma and during remission the function of external respiration was found to be lowered. Sensitivity of the broncho-pulmonary apparatus to acetylcholine in pollen asthma fluctuated from 0.001 to 1% and corresponded to the severity of the disease. Threshold doses of a specific pollen allergen was from 1:1024 to the units of protein nitrogen 10 000 in 1 ml. The authors assume that normal indices of the external respiration function during remission of pollen bronchial asthma with a protracted course are characteristic of the atopic form of bronchial asthma (as distinct to an infectious-allergic form).

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