

# Aspecific nasal reactivity in allergic and non-allergic rhinopathy

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## SUMMARY

*The Allergo-Immunology Department of the 2nd ENT Division of Rome University studied the behaviour of aspecific nasal provocation with methacholine bromide and with H<sub>2</sub>O at 2-4°C in five groups of patients thus divided: normal subjects, subjects affected by allergic rhinitis, subjects with positive reaction to Graminaceae in and out of season, subjects affected by perennial rhinitis due to D.Pt., and those affected by perennial rhinitis of non-allergic origin.*

*All subjects underwent complete E.N.T. check-ups, anterior rhinorheomanometry (RRM), mucociliary clearance test (MCT) and evaluation of amount of nasal secretion.*

*We were able to observe that nasal provocation with methacholine bromide, though on the one hand it was not able to provoke a significant reaction in the mucociliary transport function even though it caused a substantial reaction in the conductance in all five groups, on the other hand it caused a significant modification of nasal secretion with varying levels in the different groups.*

*Furthermore, it was to be observed that nasal provocation with a cold water solution set at 2-4°C caused a more significant reduction of the nasal conductance in subjects affected by perennial rhinitis of non-allergic origin in comparison to the other groups taken into consideration, even though it did not cause particular variations in the parameters relative to mucociliary transport and nasal secretion.*

Patients suffering from perennial rhinitis are subject to an excessive mucosal reactivity of the upper airways which, compared with normal subjects, tend to react more intensely to various aspecific stimuli such as temperature, humidity, physical and mental stress etc.

This hyper-reactivity of the nasal mucosa in these subjects is similar to that to be seen in the asthmatic patients (Curry, 1957; Itkin, 1967; Porkez, 1965; Tiffenau, 1958), and can be evaluated by using aspecific agents for the bronchial provocation tests, which help us to carry out the diagnosis and the subdivision of these

patients into secondary groups according to the stage of the illness (Sheldon et al., 1975).

This excessive reactivity to be found in subjects suffering from the perennial non-allergic form or rhinitis, results from a lack of balance of the autonomous nervous system with a predominant parasympathetic factor (Girard et al., 1974; Mygind, 1978), the symptoms of which are caused by the liberation of chemical mediators by the mastocytes. However, the submucosal glands have little or no receptors for histamin and therefore it is taken for granted that this histamin provokes this hypersecretion of the nasal mucosa by means of the epithelial irritant receptors (Okuda, 1977) and consequent reflex activity on the secretory nerves; thus, stimulation via parasympathomimetic chemicals (Borum, 1979) such as methacholine should produce a stronger nasal secretion in these non-allergic perennial subjects in comparison with normal subjects (Filiaci et al., 1982).

Furthermore, since there is a state of Autonomic Imbalance (Mygind, 1978), in these non-allergic perennial rhinitis patients, water should be able to modify this status. The purpose of our research was to study the nasal reactivity of aspecific origin in homogenous groups of subjects suffering from allergic rhinopathy with  $\beta$ -acetyl-methacholinebromide and with an aqueous solution at 2-4 °C and compare the results to those obtained both in normal and in perennial rhinopathics of non-allergic origin.

#### MATERIALS AND METHODS

We took into consideration 67 subjects, ranging from 18-60 years of age, 32 males and 35 females; subdivided in the following groups:

- 15 subjects considered to be in normal general and local conditions;
- 15 subjects with occasional allergic rhinitis, caused by reaction to Graminacee, not during Spring;
- 7 subjects with seasonal allergy to Graminacee, during Spring;
- 15 subjects affected by perennial rhinitis caused by reaction to *Dermatophagoides Pteronissimus* (D.Pt);
- 15 subjects with perennial rhinitis of non-allergic origin.

All subjects had been diagnosed after taking clinical history, results of skin tests, specific nasal provocation and RAST.

The preliminary results of aspecific nasal provocation, carried out with  $\beta$ -acetyl-bromide, using a pre-programmed doser, at levels of 2, 4, 8 mg in 0,4 ml of distilled water has shown that 4 mg is the level at which we are able to obtain good results without causing side effects; for the cold water test we used 0,40 of bidistilled water at 2-4 °C.

Before nasal provocation with the doser and after having a sample of nasal secretion, for 15 minutes, in order to evaluate the amount of such a secretion, the subjects underwent:



- complete E.N.T. examinations;
- anterior rhinorheomanometry (RRM) to evaluate the degree of perviety of each single nasal fossa (Crifò et al., 1975);
- test of mucociliar transport (TMC) (Filiaci et al., 1981).

The results underwent statistical analysis by a Duncan Multiple Internal Range Test.

RESULTS

From the analysis of the data relative to basal nasal conductance (Figure 1) it can be observed that nasal stenosis was more prevalent in the groups of subjects affected by perennial rhinitis of non-allergic origin (m.v. 0,715), followed by positive to D.Pt (m.v. 0,756) and by positive Graminacee during the spring crisis (m.v. 0,595). Furthermore there is a significant difference ( $p < 0,01$ ) as regards the control groups (m.v. 0,978) and the positive Graminacee not during the spring crisis (m.v. 0,979) in whom the mean values are within the norm.

After stimulation with  $\beta$ -acetyl-methacholine bromide, we noticed a reduction of average values of nasal conductance in all groups though there was a greater reaction ( $p < 0,01$ ) in the groups of subjects affected by perennial rhinitis of non-allergic origin (m.v. 0,528), in those with positive reaction to D.Pt (m.v. 0,628) and in those with reaction to Graminacee during the spring crisis (m.v. 0,438). Stim-

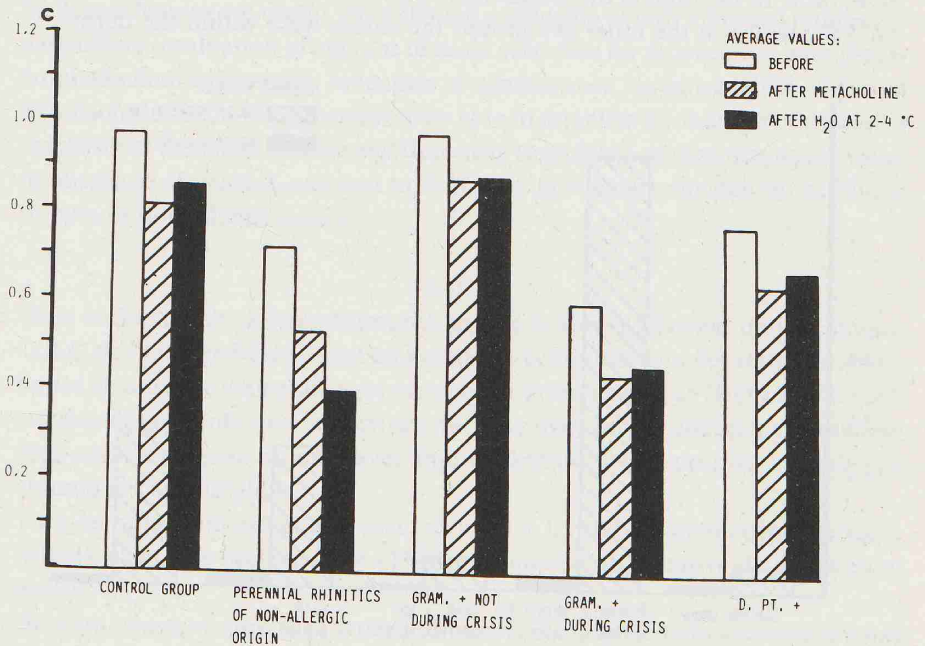


Figure 1. Aspecific reactivity of nasal mucosa: nasal conductance.

Table 1. Average values of mucociliary clearance before and 15' after provocation with methacholine bromide and with water solution at 2-4 °C in normal subjects in perennial rhinitis of non-allergic origin, in nasal atopsics during and out of crisis, and in D.Pt positives.

groups	muco-ciliary clearance		
	before	after methacholine bromide	after water solution at 2-4 °C
control	11' 49"	13' 18"	12' 31"
perennial rhinitis of non-allergic origin	16' 57"	18' 57"	18' 20"
positive graminacee out of crisis	11' 36"	12' 24"	11' 48"
positive graminacee during crisis	16' 34"	18' 17"	17' 17"
positive to D.Pt	16' 00"	18' 43"	17' 24"

ulation with water solution at 2-4 °C provokes a reduction of nasal conductance in all groups, more significant ( $p < 0,01$ ) in the group of subjects affected by perennial rhinitis of non-allergic origin (m.v. 0,399) with a 44% fall in comparison with basal values.

After analysis of the behaviour of mucociliary clearance in the five groups (Table 1) we noticed a significant prevalence ( $p < 0,01$ ) of pathological data in the individuals with non-allergic perennial rhinitis (m.v. 16' 57"), in the D.Pt positives (m.v. 16' 00") and in the Graminacee positives during the spring crisis (m.v. 16' 34"), whilst in the other two groups the values were within the norm.

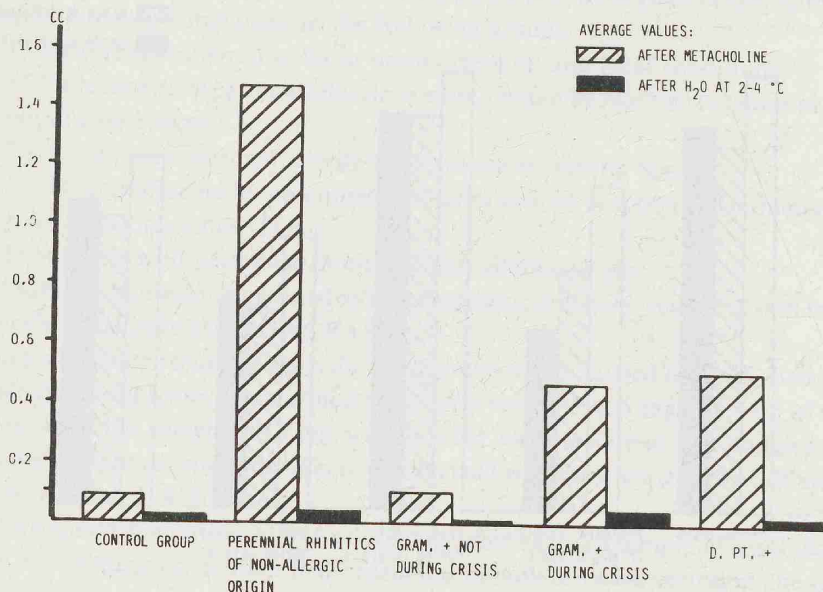


Figure 2. Aspecific reactivity of nasal mucosa: quantitative evaluation of nasal secretion.

Mucociliar transport after provocations with  $\beta$ -acetyl methacholine bromide and  $H_2O$  at  $2-4^\circ C$  has revealed an increase in the clearance time in all groups, which was more evident ( $p < 0,01$ ) in the groups of subjects affected by perennial rhinitis of non-allergic origin (m.v.  $18' 55''$  after methacholine and  $18' 18''$  after water solution), in those with positive reaction to D.Pt (m.v.  $18' 43''$  after methacholine and  $17' 24''$  after water solution) and in those with positive reaction to Graminaeae during the spring crisis (m.v.  $18' 17''$  after methacholine and  $17' 17''$  after water solution).

Finally, from the data relative to the amount of nasal secretion (Figure 2), it can be observed how, subsequent to provocation with  $\beta$ -acetyl-methacholine bromide, the average results of the control groups and of the subjects with positive reaction to Graminaceae not during the seasonal crisis, were within the norm, whereas in the individuals with non-allergic perennial rhinitis we were able to observe the highest level of hypersecretion (m.v. 1,46cc) ( $p < 0,01$ ) and in subjects allergic to acarus and to graminaceae during the spring crisis the average results reached 0,50cc ( $p < 0,05$ ). After provocation with  $H_2O$  at  $2-4^\circ C$ , on the other hand, there was no particular reaction in any of the five groups.

#### CONCLUSIONS

The aspecific nasal provocation test was seen to be easy to carry out and without side effect at the dosage levels used in our study.

Such conclusions are useful, even though applicable to only a limited number of parameters (evaluation of amount of nasal secretion for provocation with  $\beta$ -acetyl-methacholine bromide, reduction of conductance via provocation with cold water solution at  $2-4^\circ C$ ), in order to be able to establish a condition of excessive reactivity of the nasal mucosa and they have therefore a precise diagnostic value in absence of positive reaction to skin tests in subjects affected by perennial rhinitis of non-allergic origin.

#### RÉSUMÉ

Chez le Service de Allergo-Immunologie de la IIème Division de la Clinique O.R.L. de l'Université de Rome on a étudié le comportement des tests non spécifiques de provocation nasale avec metacoline bromide et avec  $H_2O$  à  $2-4^\circ C$  sur 5 groupes des patients ainsi subdivisés: normals, avec rhinite allergique, Graminacées-positifs en crise ou non, avec rhinite chronique Dpt-positifs, avec rhinite chronique pas allergique.

Tous les sujets ont été étudié avec: visite O.R.L., rhinomanométrie antérieure (RRM), clearance muco-ciliaire (TMC), évaluation quantitative de la sécrétion nasale.

On a pu constater que la provocation nasale avec metacoline bromide n'a pas modifié de façon significative la fonction de transport muco-ciliaire même en



ayant produit une réduction substantielle de la conductance dans les 5 groupes; toutefois elle a provoqué de violentes modifications de la sécrétion nasale selon les groupes étudiés.

De plus, on a remarqué que la provocation nasale avec de l'eau froide à 2-4 °C a provoqué une réduction de la conductance plus marquée dans les sujets avec rhinopathie chronique pas allergique que dans les autres groupes examinés; toutefois elle n'a pas produit de considérables changements des paramètres du transport muco-ciliaire et de la sécrétion nasale.

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